OFFICIAL NOTICE AND AGENDA
of a meeting of a City Board, Commission, Department Committee, Agency, Corporation, Quasi-Municipal Corporation, or Sub-unit thereof.

A Meeting of **Wausau Water Works Commission** will be held in the **Council Chambers, 1st Floor City Hall, Wausau, WI 54403** at **1 : 30 p.m.** on **Tuesday, August 3, 2021.**

Members: Katie Rosenberg (President), Dawn Herbst, Jim Force, Joe Gehin, John Robinson

AGENDA

1. Approve Minutes of July 6, 2021 Meeting.
2. Director's Report on Utility Operations
   - Asset Management Software
   - RFP for Proposals – LSL Replacement Plan
   - Private LSL Update
   - Leak Detection Survey
   - Boring Crew Hit Water Main
   - Well 3
   - Staff Struggling with Locates
   - DWTF Update
   - Wastewater Plant to Meet Permit Limits for July
   - Wastewater Plant Mechanic Position
   - Smoke Testing
   - WWTF Update
3. Discussion and Possible Action on a Solar Agreement with WPS.
4. Discussion and Possible Action on Recruitment and Retention for Utility Employees.
5. Discussion and Possible Action on a Biosolids Sampling Plan for PFAS.

Adjourn.

Next meeting scheduled for **September 7, 2021 at 1:30 P.M.*

THIS NOTICE POSTED AT CITY HALL AND EMAILED TO CITY PAGES AND DAILY HERALD: July 30, 2021 at 10:30 a.m.

This meeting is being held in person and via teleconference by calling 1-408-418-9388. The Access Code is 1464 76 6196 and the password is XAk6y9EMPV8. All public participants' phones will be muted during the meeting. Members of the public who do not wish to appear in person may view the meeting live over the internet on the City's YouTube Channel http://tinyurl.com/WAAMedia, live by cable TV, Channel 981, and a video is available in its entirety and can be accessed at https://tinyurl.com/wausaucitycouncil. Any person wishing to offer public comment who does not appear in person to do so, may e-mail michelle.weasler@ci.wausau.wi.us with "Water Commission public comment" in the subject line prior to the meeting start. All public comment, either by email or in person, will be limited to items on the agenda at this time. The messages related to agenda items received prior to the start of the meeting will be provided to the Chair.

In accordance with the requirements of Title II of the Americans with Disabilities Act of 1990 (ADA), the City of Wausau will not discriminate against qualified individuals with disabilities on the basis of disability in its services, programs or activities. If you need assistance or reasonable accommodations in participating in this meeting or event due to a disability as defined under the ADA, please call the ADA Coordinator at (715) 261-6590 or ADAServices@ci.wausau.wi.us to discuss your accessibility needs. We ask your request be provided a minimum of 72 hours before the scheduled event or meeting. If a request is made less than 72 hours before the event the City of Wausau will make a good faith effort to accommodate your request.

Minutes of July 6, 2021

A meeting of the Wausau Water Works Commission was called to order at 1:32 p.m. in City Hall on Tuesday, July 6th, 2021. In compliance with Wisconsin Statutes, this meeting was posted and receipted for by the Wausau Daily Herald on July 1st, 2021.

Members Present: President Rosenberg, Commissioners Robinson, Herbst, Force, Gehin.
Others Present: Scott Boers, Dave Erickson, Valerie Swanborg, Nathan Miller, Tonia Westphal/Clark- Dietz, Stephen Opatik/Beecherhoppe, Via Webex- Chris Collins/Sunvest, Toni Vanderboom.

1) **Approve Minutes of June 1st, 2021 Meeting.**

Motion to approve minutes by Herbst, Seconded by Gehin.

Robinson requests moving forward to have minutes capture the intent of the motion and compress the minutes.

Motion to approve the minutes and have briefer minutes in the future, motion carried 5-0, passes unanimously.

2) **Director's Report on Utility Operations.**

Boers asked if there were any questions.

Force asked if the leak detection survey was on going.

Boers states the contractor will be here until Monday and we should have a report at the next meeting.

Robinson asked about the CW3 well's purpose.

Boer's reiterated some comments noted in the agenda item, discussion between Robinson and Gehin outlined reasons and requirements of the superfund agreement signed in 1988 with EPA. Discussion also included work being done to move towards complete shutdown of well 3.

Force asked on the Lead and Copper sampling as an investigative basis.

Boers replied we gave the option to the Homeowner's on the list approved by the DNR that we take the regulatory samples from annually. The upper limit is 15 ppb we were at 4.9 ppb so that was below the action level.

Force questioned what meters are going in.

Boers replied Sensus Meters in residential change outs. Director's Report placed on file, no motion needed.

3) **Discussion and Possible Action on a Utility Owned Solar Array or Partnership with WPS.**

Robinson states we should explore this and continue to see other opportunities going forward in partnership. Makes a motion to move forward with the utility implementing the solar array panels but to continue to explore partnership opportunities with all other entities.

Seconded by Force to entertain a motion with the utility owned array but continue to explore other possible partnerships. Motion carried unanimously.

4) **Discussion and Possible Action on the LSL Replacement Program.**

Boers presented the updated costs from the previous memo last month and the recommendation was to go with the option of contracting the work out.

Force agrees with the recommendation of using outside contractors to replace the private and public side, it makes sense, because with this job market we might not be able to find crew members to hire plus the resources required for training. We do need a mandated ordinance to replace the owner's side in the city.

Rosenberg asked if that was a motion to go with replacement program using contracted services, while maintaining our efforts, moving forward with a good communications outreach plan, and looking at an ordinance change.

Force states he will make that motion. Seconded by Herbst. Passes unopposed.

5) **Discussion and Possible Action on the Sole Source Purchase Request for the Rehabilitation and Retrofit of the 2.5 MG Prestressed Concerete Tank, Elm St. Reservoir.**

Boers presented the Commission with the project description and costs. Stating the current budget for this project is $180,000.

Gehin motioned to move forward with the planned rehab of the 2.5 MG reservoir. Seconded by Herbst. Passes unanimously

6) **Adjourn.**

There being no further business to discuss, the meeting is adjourned.

WAUSAU WATER WORKS
FOR YOU!

MEMORANDUM

TO: President Rosenberg
Commissioner Herbst
Commissioner Force
Commissioner Gehin
Commissioner Robinson

FROM: Eric Lindman, P.E.
Director of Public Works & Utilities

SUBJECT: Director's Report – July 2021

- Staff is currently working on moving forward with implementing Asset Management software. Different divisions have been talking with various venders and what is available. We will begin coordinating efforts and arranging presentations with outside vendors to determine what features of software may work best for us and within each of the divisions. Once we fully understand our needs and what is available to us to work with an RFP will be prepared for vendors to solicit proposals. I would like to end up with one software that may work with all of the divisions within the department.

WATER DIVISION

1. The water utility will be preparing an RFP to solicit proposals for assisting with the preparation of a LSL replacement plan. The plan will be extensive and include everything from communication outreach, funding sources, developing accurate inventory, data tracking to replacement and post replacement requirements. I expect the utility will have a consultant on board before the holidays. Once staff has reviewed proposals we will bring them to the Commission with a recommendation.

   I met with other departments in the city as well as with other divisions as this effort will require many resources outside of the utility. Community Development will assist with tracking Davis-Bacon requirements due to federal funding, CDBG funds may be used to help fund replacements on an annual basis in LMI areas and they also have a program for LMI households to receive no interest loans for their portion of the work. Inspections

will be heavily involved as both plumbing and excavation permits will be required for each service. Over the course of the next few months we will be looking at our permit process and making necessary changes along with changes to the WMC as necessary. Staff will be working with legal on both the WMC changes as well as developing a proposed mandatory replacement ordinance for the Commission's consideration moving forward.

2. Private LSL Update;
    a. 720 letters sent
    b. 239 customers showed interest
    c. 49 estimates received
    d. 32 replacements completed and paid (3 of those service leaks)
    e. Total paid out - $117,310.79, Balance remaining - $332,689.21

3. Leak Detection Survey, conducted by Westrum Leak Detection.

4. Another boring crew working for TDS hit a water main Friday July 23rd.

5. As of 7/29/21 GHD has not yet received a response regarding well 3 from EPA. Information will be brought forward as it is provided.

6. Staff is still struggling with an extraordinary number of locates, 5220 tickets already this year.

7. DWTF Update

WASTEWATER DIVISION

1. The wastewater plant is on track to meet permit limits for July.

2. We have interviewed candidates for our open Wastewater Plant Mechanic position and HR is following up on a job offer.

3. Strand Engineering is back this week to complete the collection system smoke testing.

4. The waste water plant upgrade is proceeding rapidly.

Wausau, Wi.

Computerized Leak Detection Survey

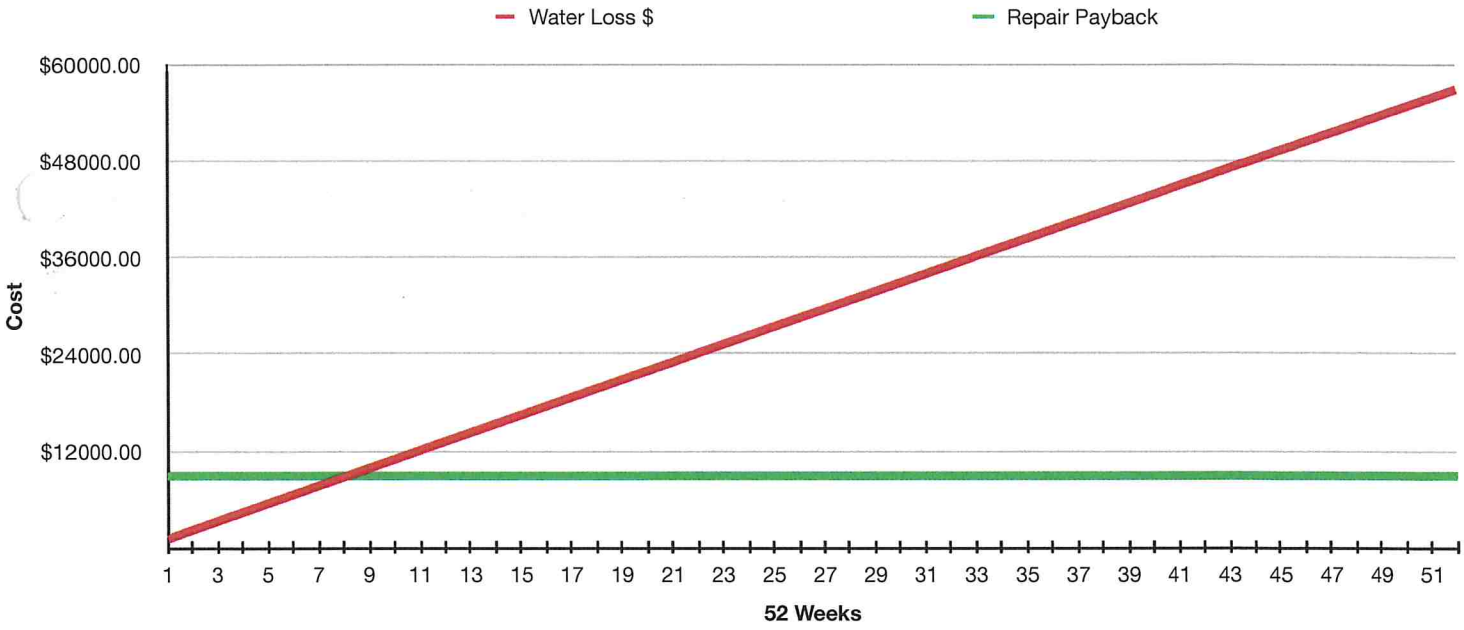
7/12/21

Cost Analysis

This survey was conducted by Westrum Leak Detection utilizing the latest leak detection correlation technology to pinpoint suspected leakage in the system. The following leaks were located.

Leak Chart is $1 per 1000 gallons lost

	No. of Leaks	GPD (per leak)	Millions per year	Dollars per year
Main leaks	5	26,000	47.45	$47,450
Abandoned leaks	0	0	0	$0
Service line leaks	4	5,000	7.3	$7,300
Valve leaks	0	0	0	$0
Hydrant leaks	6	1,000	2.19	$2,190
Total	15	32,000	56.94	$56,940



Survey Cost	$8,900.00
Leak cost per week:	$1,095
Estimated payback period in weeks:	**8**

As you know, because of increased production and test and maintenance costs, operation and maintaining an efficient water distribution system has become a necessity. The most effective method to reach and maintain that goal is with an annual leak detection program. We appreciate the opportunity to serve you.

WESTRUM LEAK DETECTION	3226 360th St Stratford, IA 50249	515-838-2222 (24-7) 888-500-4433 (24-7)	Cell 515-231-0122

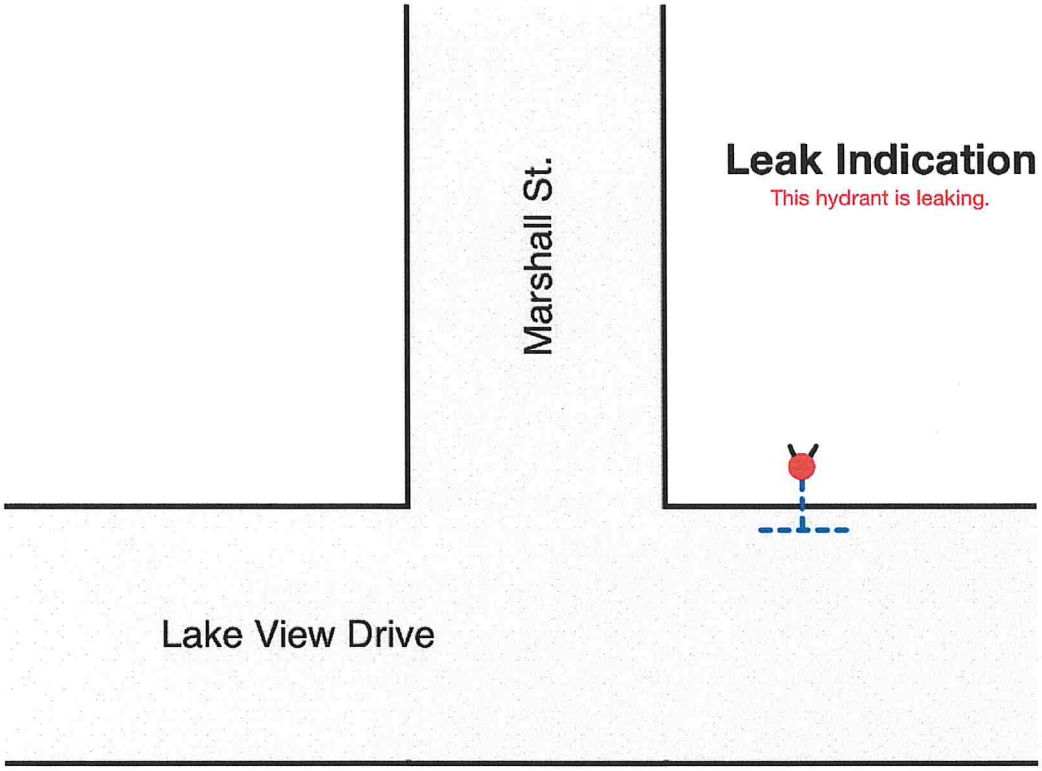
Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

Survey ☒ Service ☐ Date - 7/12/21

Leak #
1

North



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box
☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

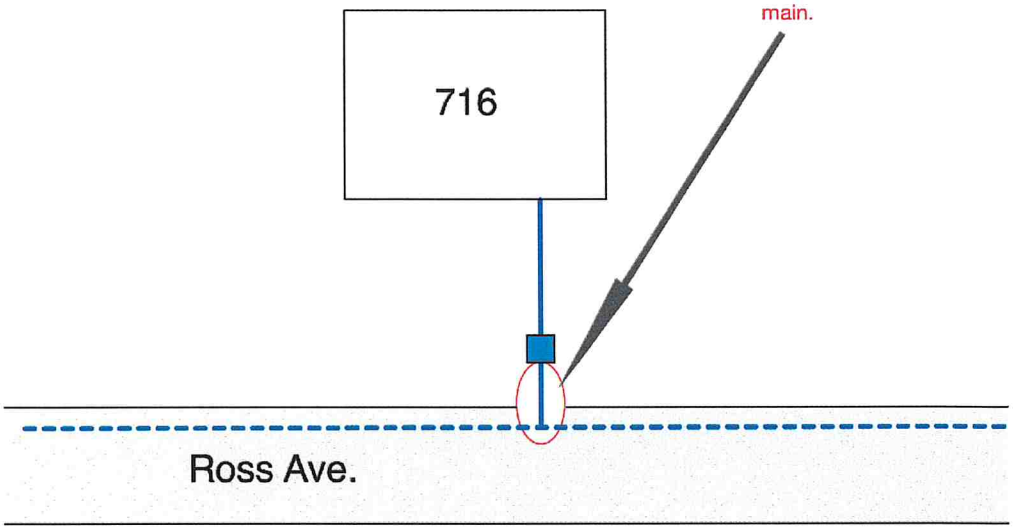
Survey ☒ Service ☐ Date - 7/12/21

Leak # 2

North

Leak Indication

This service line is leaking between the curb box and the main.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☒ YES ☐ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

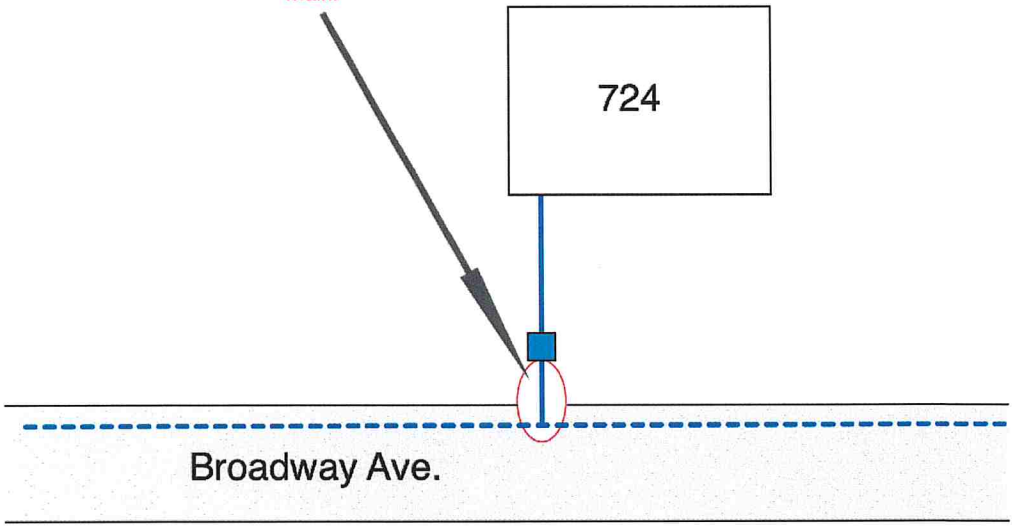
Survey ☒ Service ☐ Date - 7/12/21

Leak # 3

North

Leak Indication

This service line is leaking between the curb box and the main.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☒ YES ☐ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

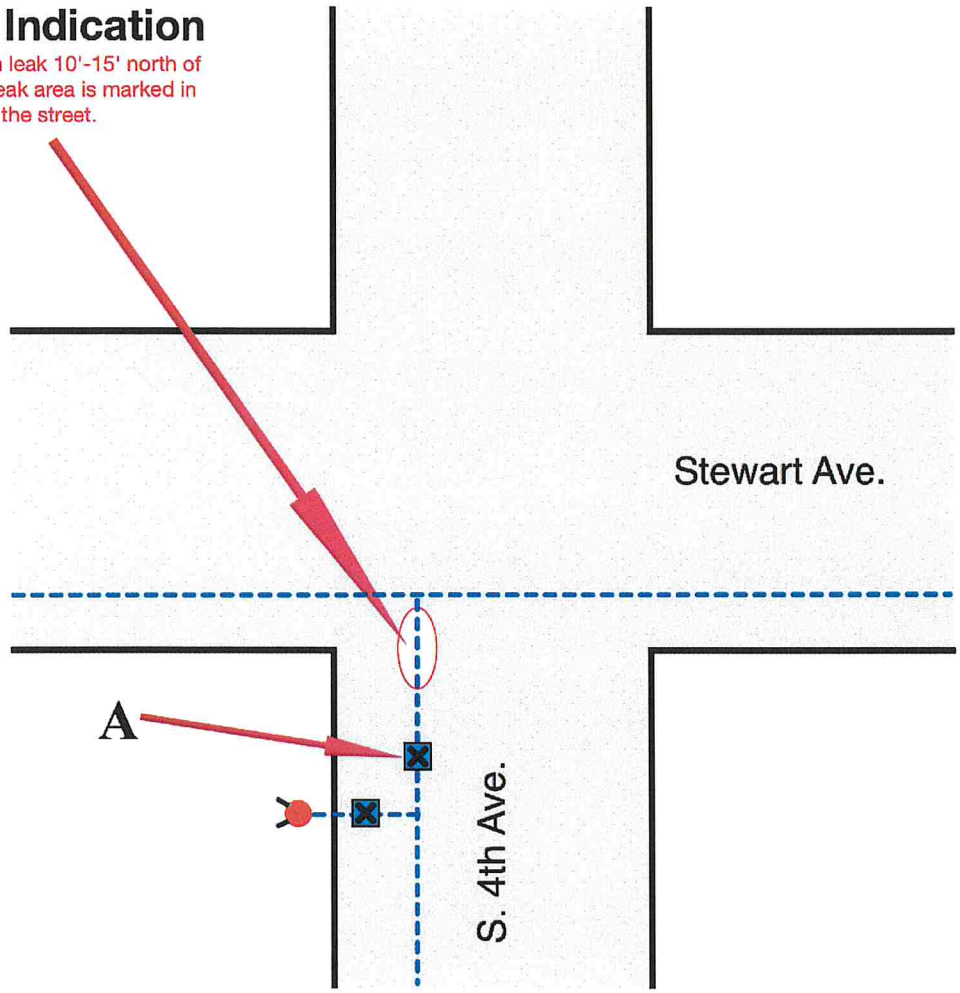
Survey ☒ Service ☐ Date - 7/12/21

Leak #
4

North

Leak Indication

Large main leak 10'-15' north of valve A. Leak area is marked in the street.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

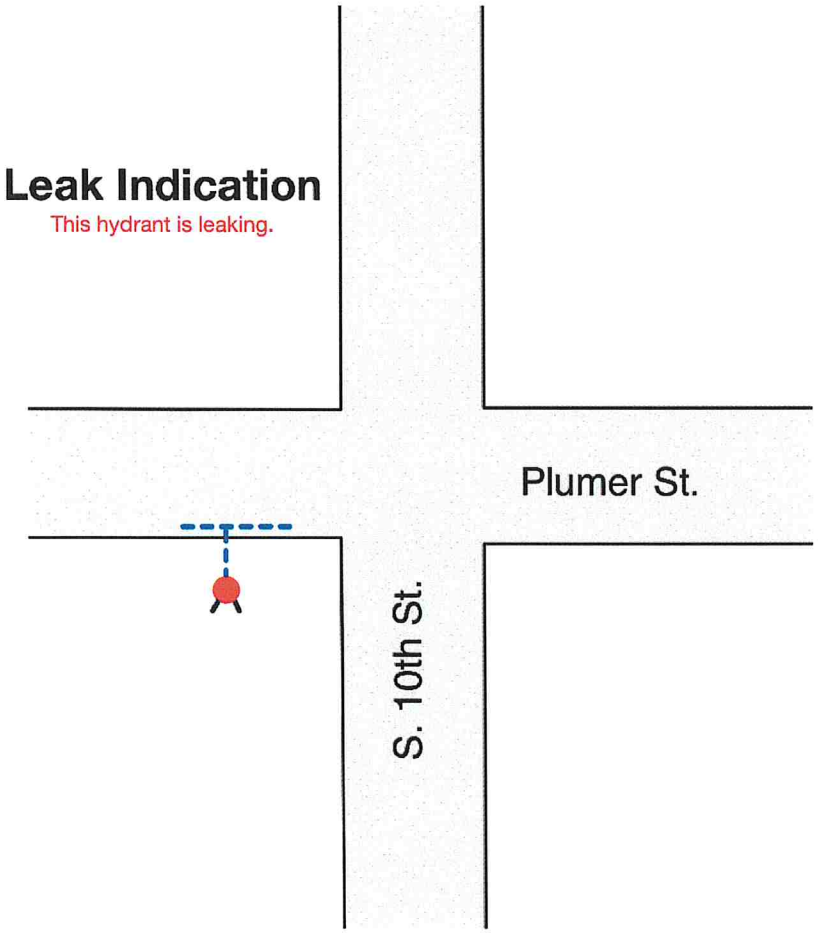
Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

Survey ☒ Service ☐ Date - 7/12/21

Leak #
5

North



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box
☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

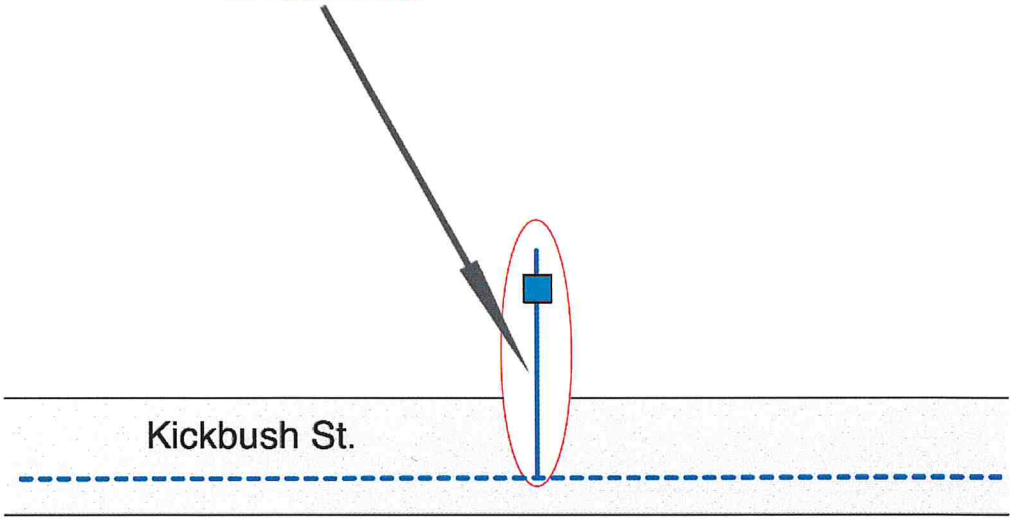
Survey ☒ Service ☐ Date - 7/12/21

Leak #
6

North

Leak Indication

This service line to this vacant lot was leaking through the curb box. We operated the curb box, & it stopped leaking.



1213

Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☒ YES ☐ NO

Description of Repair

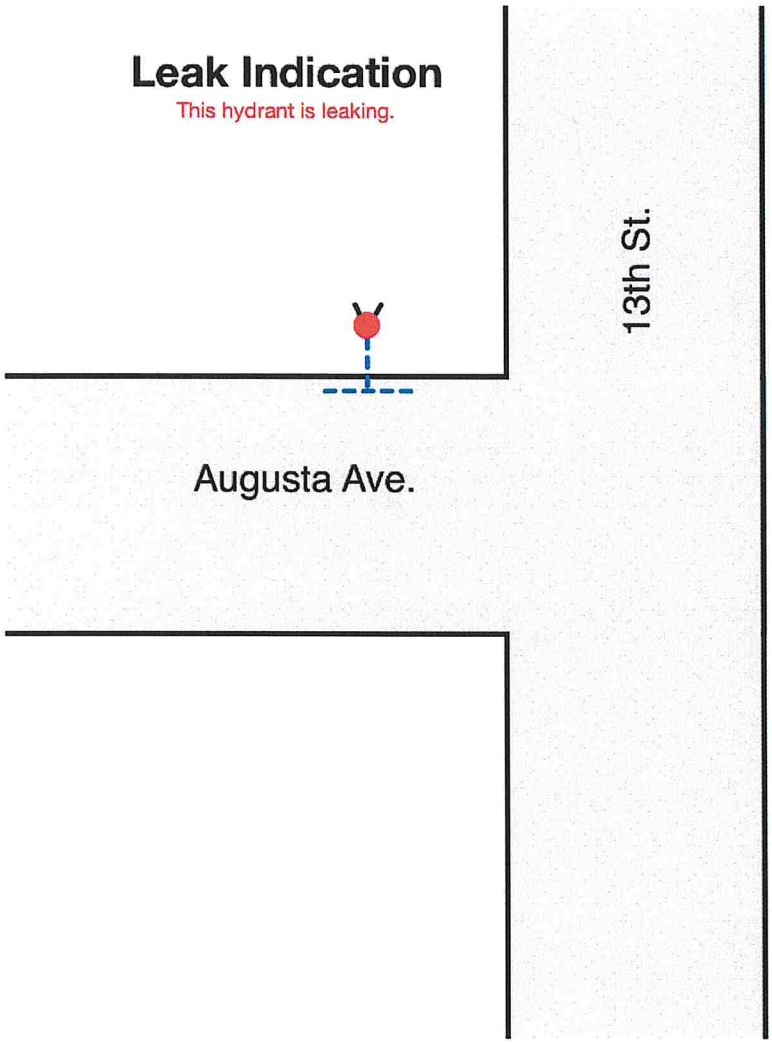
Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

Survey ☒ Service ☐ Date - 7/12/21

Leak #
7

North



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

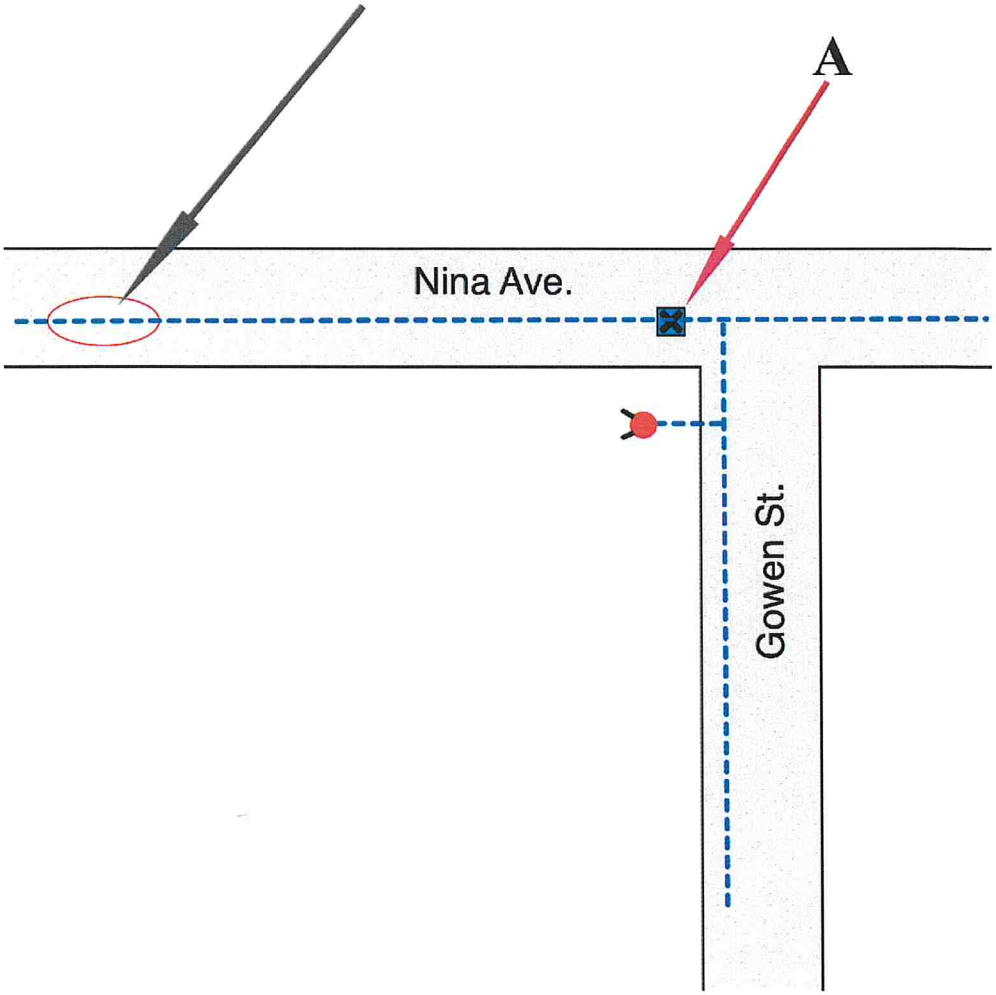
Survey ☒ Service ☐ Date - 7/12/21

Leak # 8

North

Leak Indication

Main leak 80'-85' west of valve **A**. Leak area is marked in the street.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

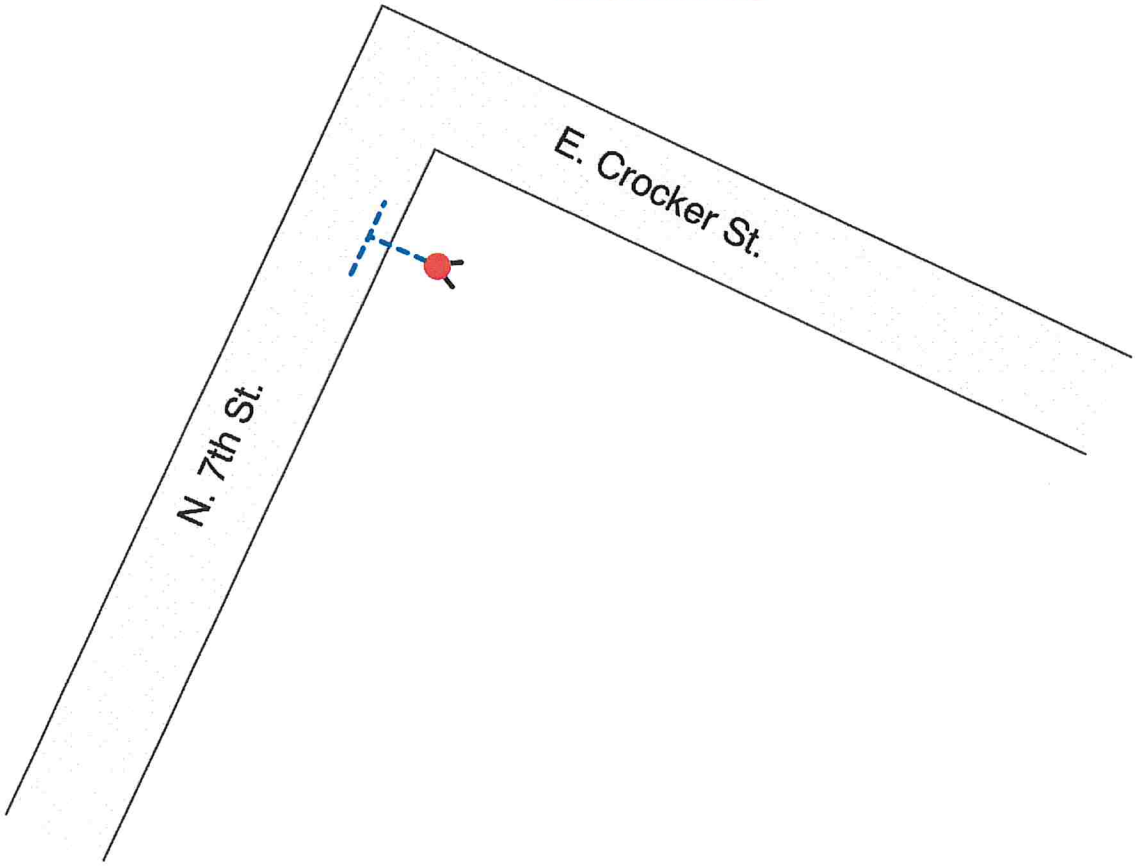
Survey ☒ Service ☐ Date - 7/12/21

Leak #
9

North

Leak Indication

This hydrant is leaking.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

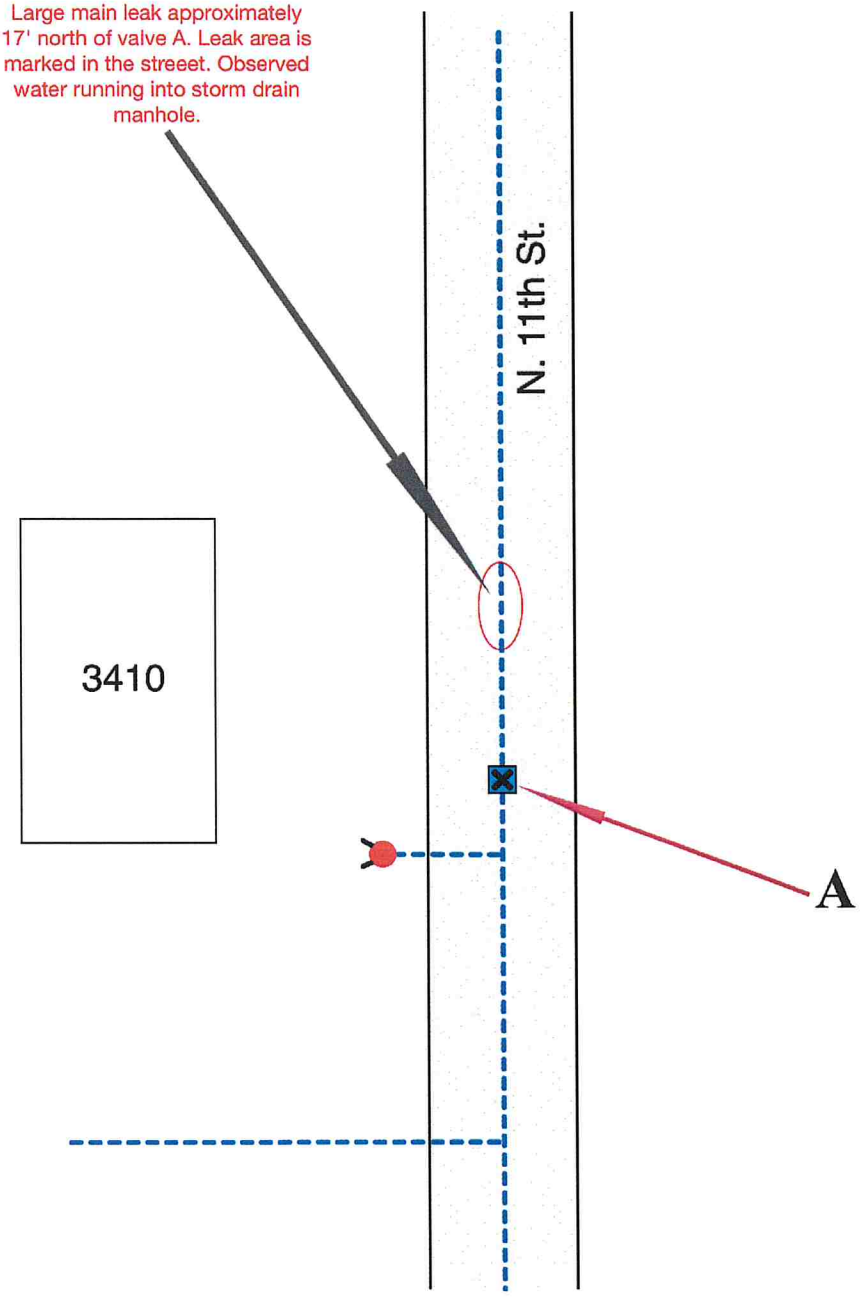
Survey ☒ Service ☐ Date - 7/12/21

Leak # 10

North

Leak Indication

Large main leak approximately 17' north of valve A. Leak area is marked in the streeet. Observed water running into storm drain manhole.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

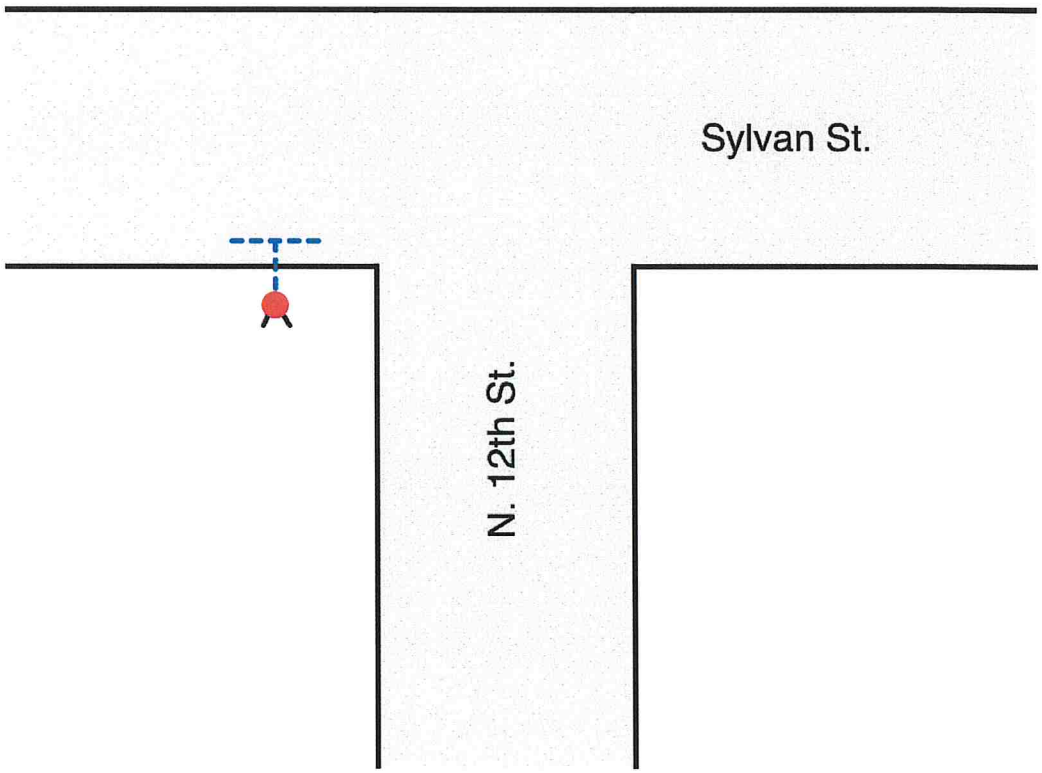
Survey ☒ Service ☐ Date - 7/12/21

Leak #
11

North

Leak Indication

This hydrant is leaking.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

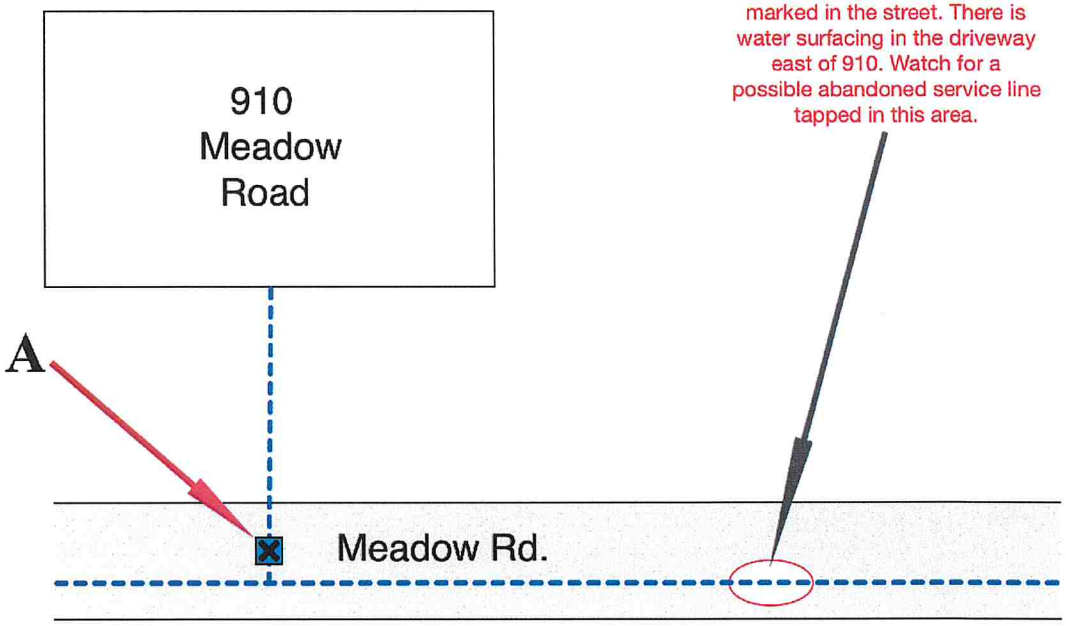
Survey ☒ Service ☐ Date - 7/12/21

Leak # 12

North

Leak Indication

Main leak approximately 92' from valve A. Leak area is marked in the street. There is water surfacing in the driveway east of 910. Watch for a possible abandoned service line tapped in this area.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

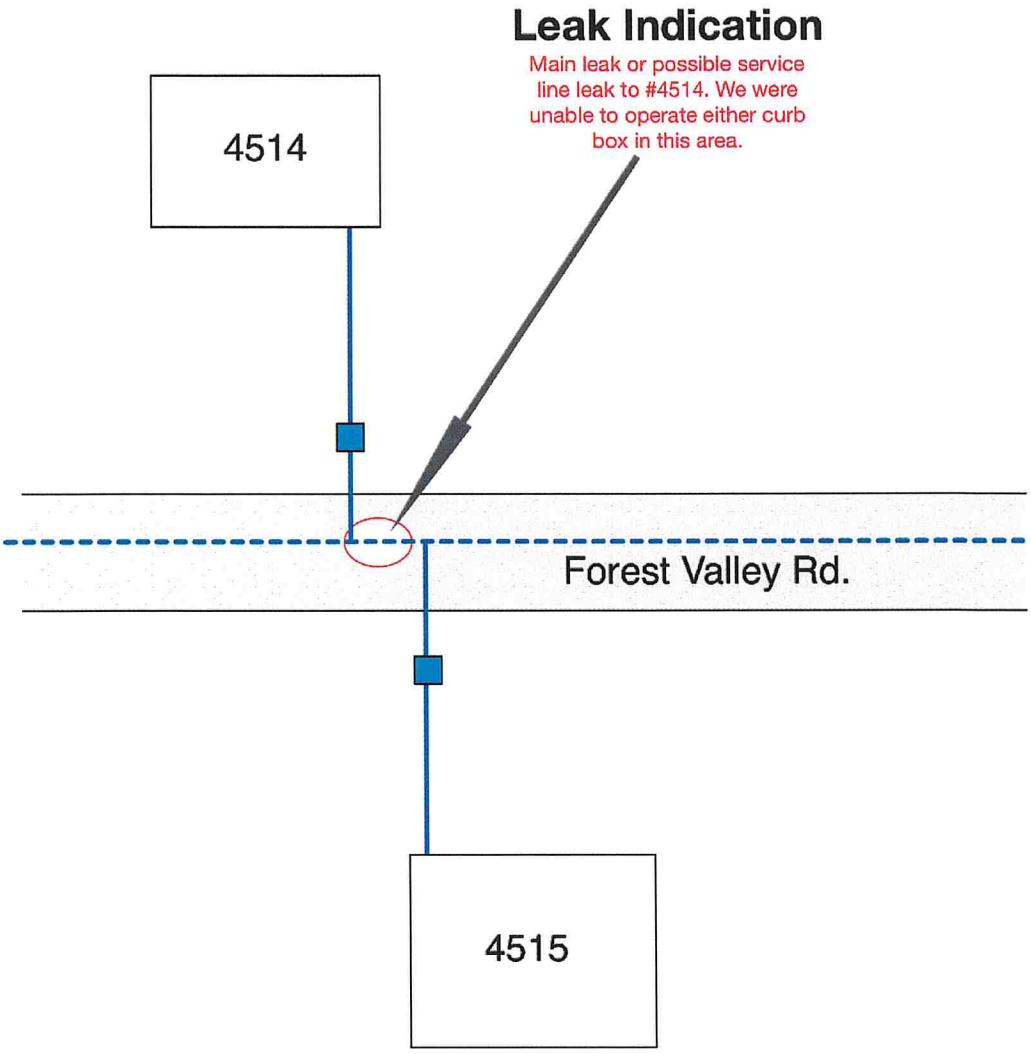
Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

Survey ☒ Service ☐ Date - 7/12/21

Leak # 13

North



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

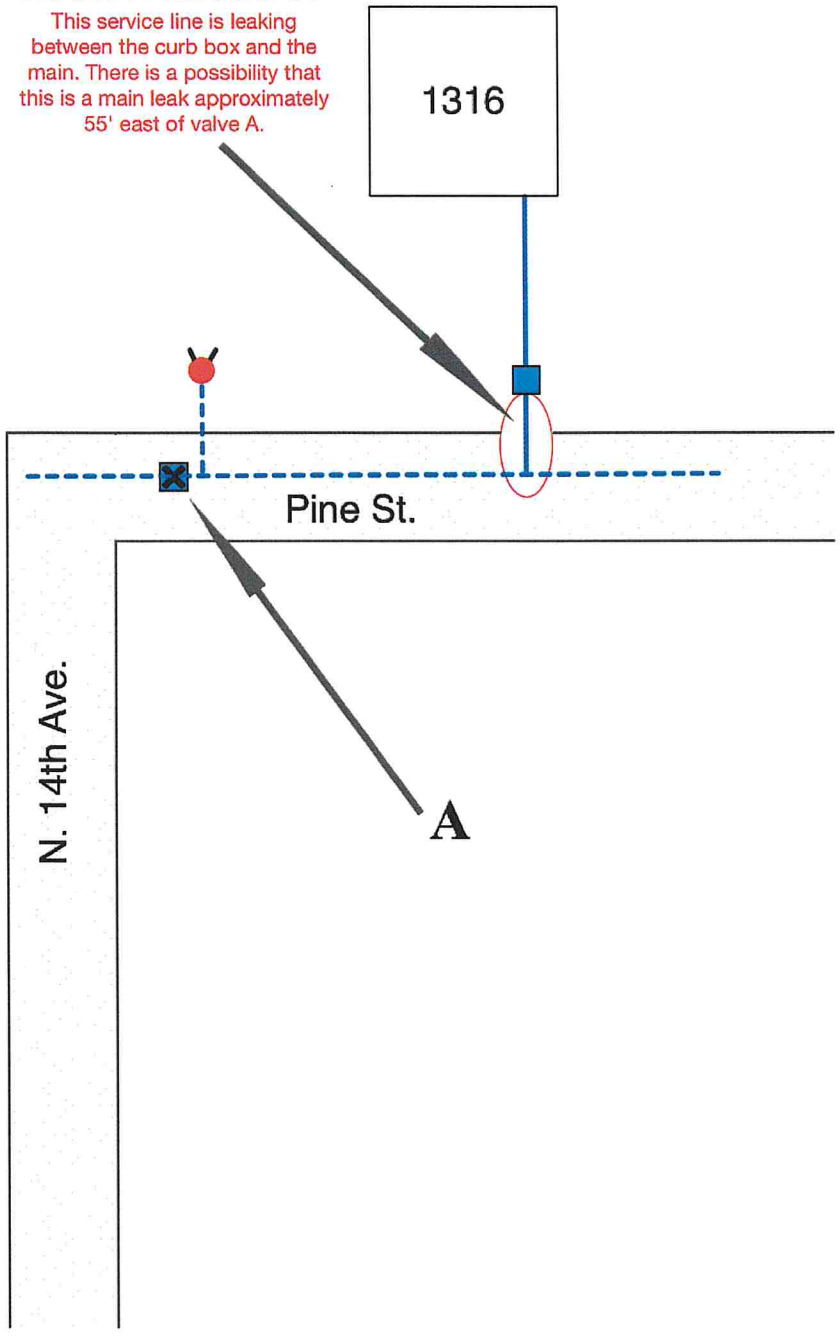
Survey ☒ Service ☐ Date - 7/12/21

Leak #
14

North

Leak Indication

This service line is leaking between the curb box and the main. There is a possibility that this is a main leak approximately 55' east of valve A.



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☒ YES ☐ NO

Description of Repair

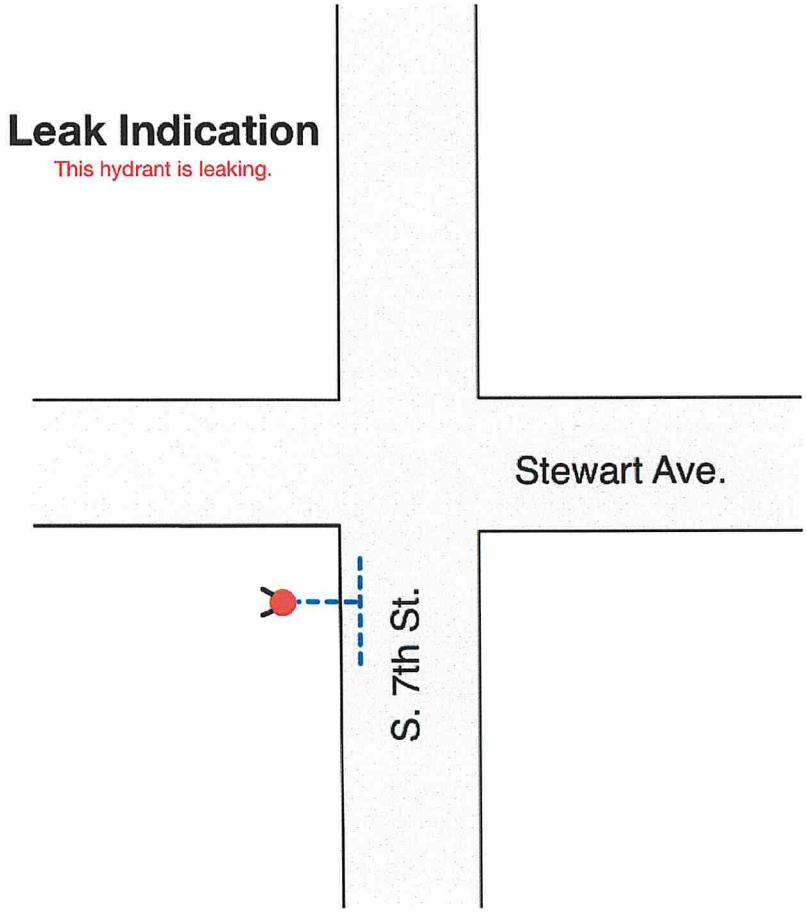
Manhole
Stop Box
Hydrant
Valve

Wausau, Wi.

Survey ☒ Service ☐ Date - 7/12/21

Leak # 15

North



Westrum Leak Detection
3226 360th St
Stratford, IA 50249
1-888-500-4433 - 24/7

Date Repaired

Operate stop box

☐ YES ☒ NO

Description of Repair

Wausau Drinking Water Treatment Facility - Project Status

July 30, 2021

Drinking Water Treatment Facility

Treatment process piping, equipment and electrical work continues to be the focus for the treatment facility. Nearly all the piping and pumps have been installed in the basement and most of the pumps on the grade level have been installed as well. Backwash equipment for the filters has been set into place and the contractor is getting ready to complete the concrete pours around them. Windows are beginning to be installed in the upper-level control room area and painting continues throughout the building.

Underground process piping is almost complete, and the contractor will begin working on storm sewer soon.

All the precast tank panels have been installed on base slabs and the contractor will begin the process of wrapping them with a heavy wire to provide structural strength. The wire will then be covered with a sprayed-on concrete to complete the structural components of the tank. Construction of the tanks is scheduled to be completed in September.

Administration Building and Garage

The steel framework for the building is almost complete and the masonry fire wall between the garage area and administration portion has been installed. Exterior masonry work continues and the contractor is going to start installing electrical conduits below the floor slabs. Floor slabs will start being poured in August with work on the rest of the building also continuing.

Panoramic View of Site Looking Southwest

Project Status Report

Wastewater Treatment Facility Improvements Project – Engineer During Construction

City of Wausau, Wisconsin

Donohue Project Number 13229

Period | June 6, 2021 – July 3, 2021

Invoice 49

Engineer Activities This Period

- Construction administration services related to technical review of contractor shop drawings, responding to contract interpretation questions (RFIs), initiating requests for proposals (RFPs), attending weekly and monthly construction progress meetings, processing work change directives to the contract, and contractor monthly payment requests.
- Prepared and submitted Clean Water Fund disbursement request and provided CWF administration.
- Provided full time Resident Project Representative (RPR).
- Provided part time on-site observation of selected work by Becher-Hoppe.
- Becher-Hoppe also provides input into appropriate shop drawing reviews, RFI responses, and RFP requests.
- Prepared Work Change Directives to address unforeseen work that needed to be expedited to allow the Contractor to maintain their construction scheduled progress.
- Design Team participating in weekly coordination calls to facilitate contractor startup of the various systems that are being scheduled for near-future startup, discussions pertaining to system commissioning and how all systems tie together to provide further detail to the construction schedule.
- The Engineer's application engineering staff are working on the various systems programming that will need to be completed as the new unit process systems are brought into operation.
- Continued coordination with WPS on new electrical service route and installation.
- Coordinating review of final punchlist list items for the Administrative portion of Str 120.
- Donohue is working with the WDNR and Owner to add a Class A [biosolids] outfall to the WPDES permit.

Engineer Near-Term Activities

- As the project proceeds, the engineer will continue to provide construction administration services including the technical review of shop drawings, responding to RFIs, preparing RFPs, attending weekly and monthly construction progress meetings, processing change orders, reviewing contractor payment requests, and providing full-time on-site resident engineering services.
- Preparation of Change Orders 8 and 9.
- Application Engineering programming.
- The Contactor is ready for punchlist walk thru for Str 105 and 350.

Contractor Progress to Date

- The Notice to Proceed with Construction was issued to the Contractor on June 18, 2020 and established the final completion date as June 3, 2023.

- Construction on the improvements to the Wastewater Treatment Facility (WWTF) began on July 6, 2020.

- Structure 100 (Main Building):
  - Miron continues demolition.
  - Steel stud work has been started in the grade level, particularly where the old administration offices were.
  - Mechanical, electrical and plumbing (MEP) work has been going on along with the demolition and beginning of wall form work, by August Winter and Sons, Inc. and Van Ert Electric.
  - US Oil completed the diesel fuel piping to the generators.
  - Fabick has completed the prep work on the generators which allowed them to fire up the generators for initial controls and systems checks.
  - Van Ert has continued to finalize the electrical bus duct work for the main line power, to the 100 switchgear and switchboard. They continue power wire pulls and feed work along with control work by Complete Controls.
  - HVAC and mechanical equipment work has continued by August Winters, on the main floor and roof top.
  - New exterior doors and frames are installed.
  - Concrete sidewalk along the south side of the structure was placed as well as all doorway stoops along the south and east sides of the structure.

- Structure 120 (Administration Building):
  - Landscape and plantings outside of the building have commenced.
  - Mens and womens locker room lockers have been installed.
  - Van Ert installed the 120-UPS unit.
  - Punchlist items on the interior continue to be completed.

- Structure 200 (Grit Building):
  - Masonry work (concrete masonry unit—CMU and brick) has continued around the structure.
  - Vapor barrier on the exterior CMU has been completed.
  - Precast roof planks have been set. Interior prep work for painting has started.
  - Electrical room concrete equipment pads have been poured.
  - Mechanical, plumbing and HVAC work has started in the structure as well.
  - Work on top of the roof has started.

- Structures 310, 320, 330 and 340 (Primary Clarifiers 1, 2, 3, and 4) along with Structure 350 (Primary Effluent Channel)—Structure 310 hand rail has been removed at the top foot of the tank removed.

- Structure 400 (Activated Sludge Building):
  - New windows are almost completely installed.
  - Van Ert has continued pulling wire, running conduit, setting blower harmonic filters.
  - Roof penetrations for exhaust, blowers and HVAC are in the process of being cut.

- Structure 406 (Mixing Tank): Formwork and concrete for the new mixing channel has been started. August Winters completed the return activated sludge (RAS) pipe run below the channel slab. A portion of the channel slab has been poured.

- Structure 410 (Activated Sludge Basins):
  - Demolition of existing aeration equipment has been completed in basins 4, 5 & 6.
  - Basin 6 has had the old discharge concrete weir removed.
  - Miron is prepping the east 410 structure channel for eventual placement of gates.
  - Existing gates on west side of basins have been removed to be placed on the discharge of the basins.
  - Demolition of the piping inside the west channel has been completed.
  - Preparation work has started for the new aeration equipment.

- Structure 420 (Mixed Liquor Channel) and Structure 500 (Secondary Splitter: Both of these structures have been idle. Breuer Metal has been onsite to measure structures for grating and hand rails.

- Structure 540 (Secondary Clarifier 4):
  - Dewatering of the tank has been completed.
  - Concrete finish work of launder trough and exterior of tank complete.

  - August Winters has started the installation of the interior clarifier mechanical equipment and V-Notch weirs.
  - Center ring walkway has also been placed along with the new handrail around the tank.
  - Precision has brought the grade up along the outside of the tank.

- Structure 610 (Chemical Building):
  - Placement of door frames and doors has started.
  - Omni has finished painting and coating in structure.
  - Pipe insulators have also almost completed the insulation of all piping.
  - Van Ert has installed the VFD and harmonic filters in the electrical room as well as running the wiring and controls throughout the structure.
  - Apex has installed the new fire protection system and supply line inside the mechanical room.

- Structure 700 (Digester Building) and Structures 710, 720, 730 and 740 (Digesters 1, 2, 3 and 4):
  - MEP work continues in Structure 700 (Digester Building).
  - Miron has completed the masonry work and placed the precast roof on the new stairway and gas handling room. They have also poured equipment pads for August Winters, for digester heat exchangers, digester gas boilers and natural gas boilers.
  - August Winters has been continuing with digester gas, hot water supply and return lines, glycol supply and return lines, natural gas piping and the placement of equipment.
  - Pipe insulators have been installing alongside August when time and space permits.
  - Structure 720 (Digester 2) has been cleaned and the digester roof removed for demolition.
  - Van Ert has continued with the main line conduit runs through Structure 700 to Tunnel 910.
  - Painters have started to paint the lower level and gas handling/stairway areas.

- Structure 770 (Solids Building):
  - Grout infill at the bottom of precast panels continues.
  - Doors frames, doors and windows are being placed.
  - Mechanical, electrical and plumbing work has commenced in lower level and has been ongoing in both the grade and upper levels.
  - Painters have painted the sprinkler piping, new thermal oil room CMU and the new sludge screening room.

- Concrete equipment pads in the lower lever have been completed for pumps and polymer feed systems.
- Chemical room containment area HVAC ductwork, pipe insulation and piping are complete.
- HVAC ductwork, heaters and equipment being finalized in all areas.
- Caulking of wall, door and window joints interior and exterior is ongoing.
- Roof top access dog house construction ongoing. Roofing contractor has completed gutters and downspouts to the point for external connections to storm water can occur. Dryer equipment installation is ongoing.
- All areas have unit heaters and associated piping placed.
- Work on with in the electrical room has continued: VFDs are set, switchgear pad poured, dryer local control panel set.
- The control room, lab and locker room area work including electrical, plumbing, steel stud walls, drywall, floor prep and final installation of metal stairway, painting and casework are almost complete.
- Gravity belt thickeners and belt filter presses are placed in the sludge handling room.
- Return activated sludge and cake hopper pumps and associated piping placed and cake hopper has been set.
- Miron has started the placement of door stoops and sidewalk around the structure.

- **Structure 775 (PSD Thickener) and Structure 776 (Basin Drain Pump Station 2) –** Internal mechanical equipment set for Str 775. Concrete finish work has been completed and the basin trough has been coated. Equipment access walkway has also been placed. Sidewalk connection to 770 placed.

- **Tunnel 900 –** August Winters has almost completed the racking along the east wall. Associated piping runs in the racking have started to be placed as well. Demolition of the existing piping has continued. Van Ert has pulled the main line power through the tunnel from Str 100 to Str 400. Pipe insulators have started the insulation of the HWS and HWR lines.

- **Tunnel 910 –** Van Ert has pulled main line power through the tunnel from 100, through 700 to 770.

- Site Work:
  - Integrity Grading and Excavating is working on yard storm water piping around Structure 770, as well as the potable and fire protection water lines to the north for the eventual tie-in at Structure 110.
  - Integrity is also working on the natural gas lines from Structure 770 and 700 for their eventual tie-in at Structure 110.
  - Integrity has also completed the tie-ins between Structures 600, 610 and 400 for the SSM (scum), RAS, Air, NG and miscellaneous Chemical Lines.
  - WPS was onsite to discuss the design, location and layout of the natural gas meter and connection to the main line in Adrian St.
  - WPS and their subcontractor were onsite to install the two 3,000 amp main power feeds and transformers at the west side of Structure 100.
  - Precision has provide some additional grading around Structures 540 and 770 and asphalt removal east of Structure 110, 700 and north of Structure 770 for utility piping work.
  - Duct banks O (south of Structure 770), M (between Structure 400 and 610) and Q (southeast corner of Structure 400) have been completed by Van Ert.
  - Van Ert began pulling main wire feeds to tie-in all structures to new main power switchgear.

- Construction progress photographs are located at the end of this progress report.

Period | June 6, 2021 – July 3, 2021

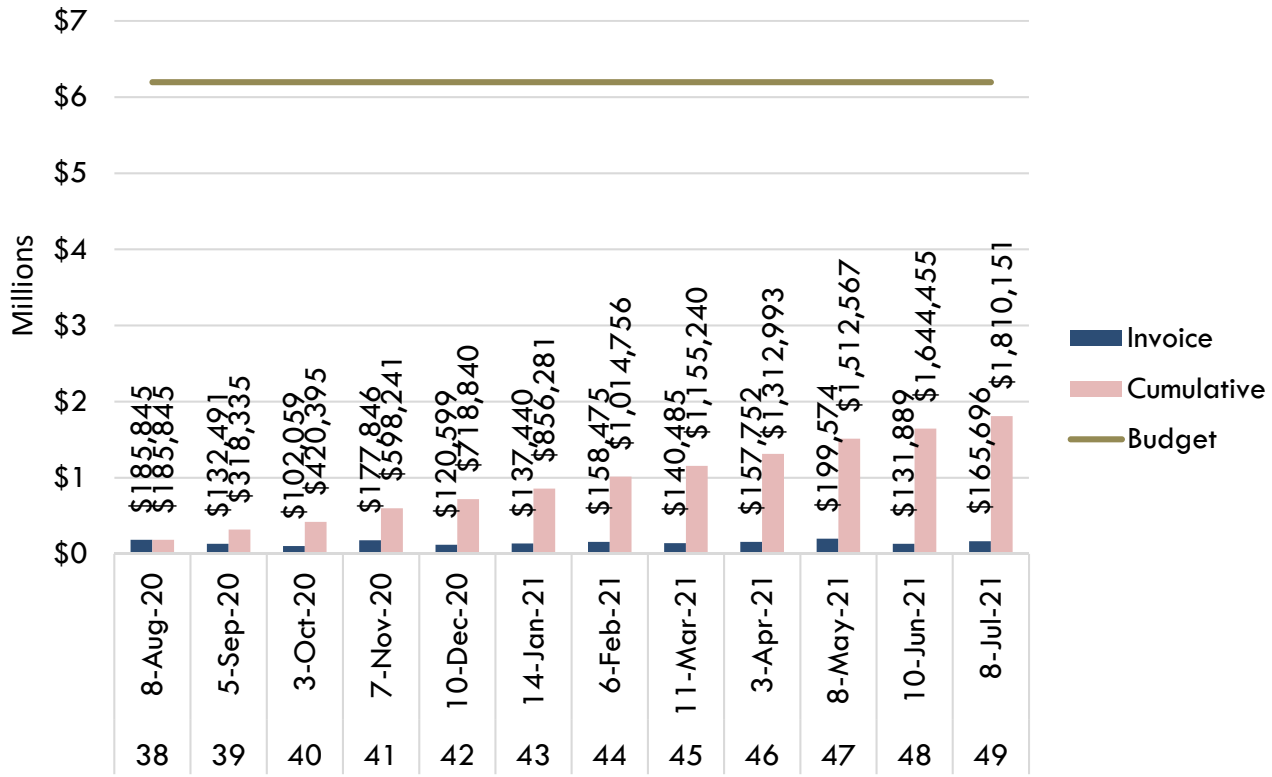
Invoice 49

Construction Schedule

- The Contractor has developed a detailed construction schedule that defines a timeline for the orderly completion of the work and a breakdown by structure of the work to be done in the various work areas. We continue to review the timeline and work tasks against the various constraints identified in the project manual to confirm that the contractor has adequately addressed them and accounted for shutdown time limits as their work proceeds.

Project Related Budget Snapshot

Construction Engineering Budget



Wastewater Treatment Facility Improvements Project – Engineer During Construction

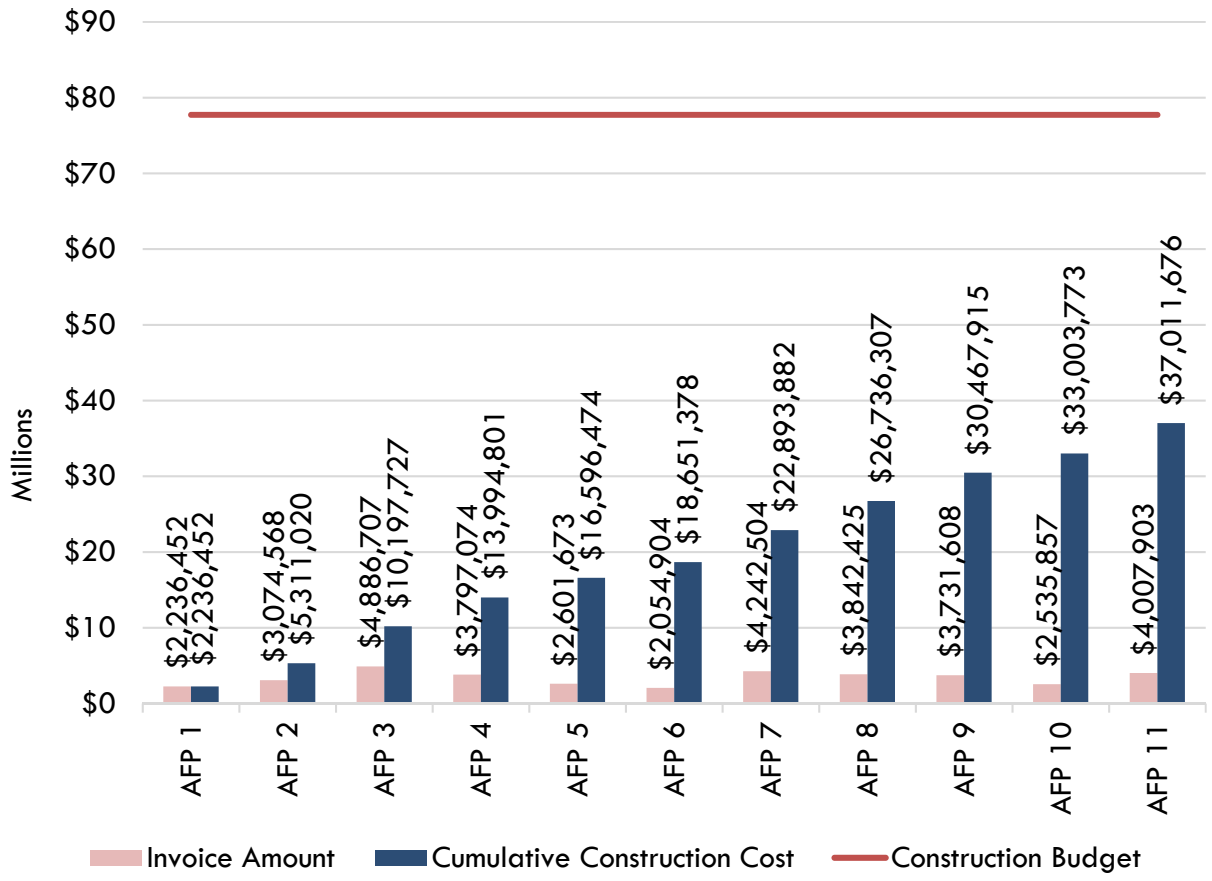
City of Wausau, Wisconsin

Donohue Project Number 13229

Period | June 6, 2021 – July 3, 2021

Invoice 49

Construction Budget: Pay Applications Approved by Engineer



Wastewater Treatment Facility Improvements Project – Engineer During Construction

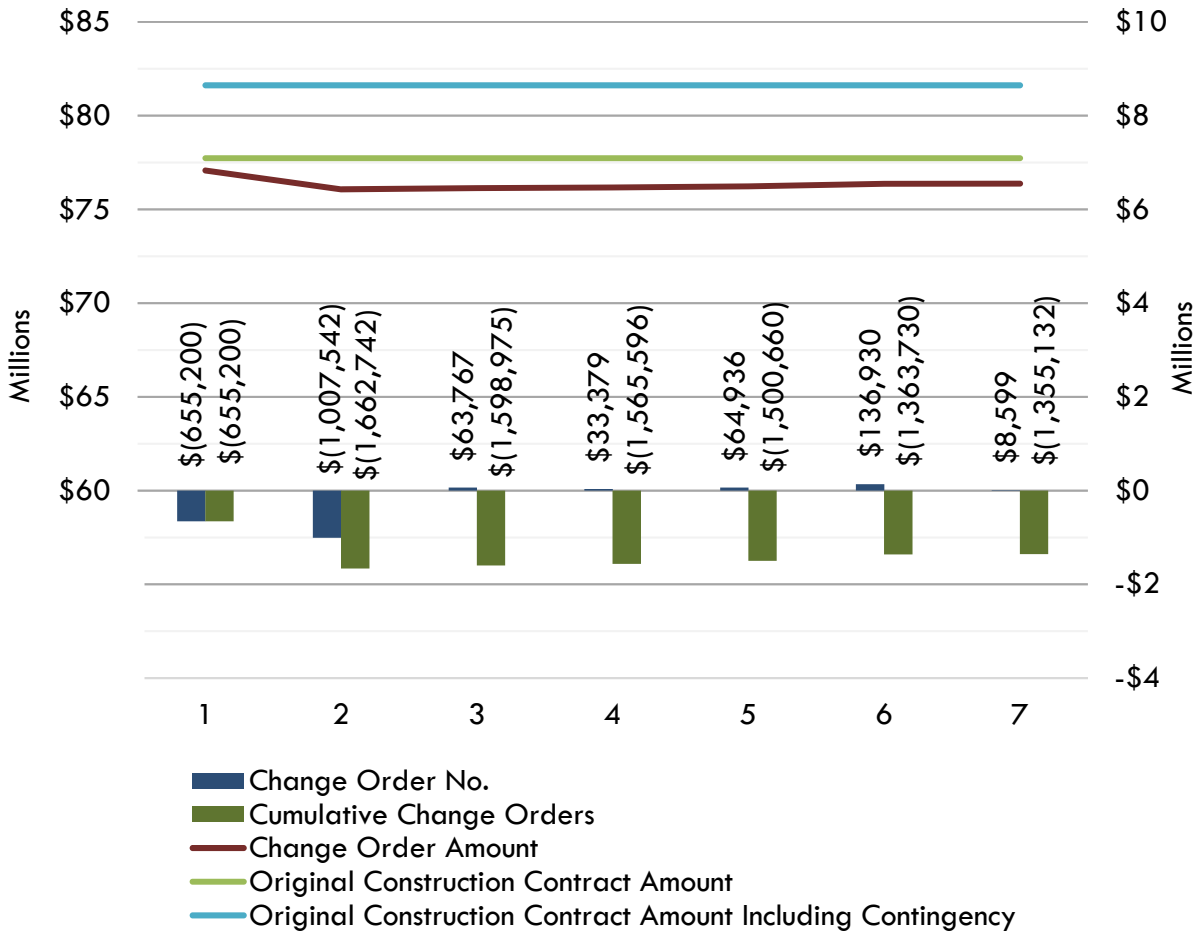
City of Wausau, Wisconsin

Donohue Project Number 13229

Period | June 6, 2021 – July 3, 2021

Invoice 49

Overall Project Budget



Budget Notes:

1. No budget issues at this time.

Remarks

1. None.

Construction Photographs

Wausau Wastewater Treatment Facility
City of Wausau

Construction Update #12

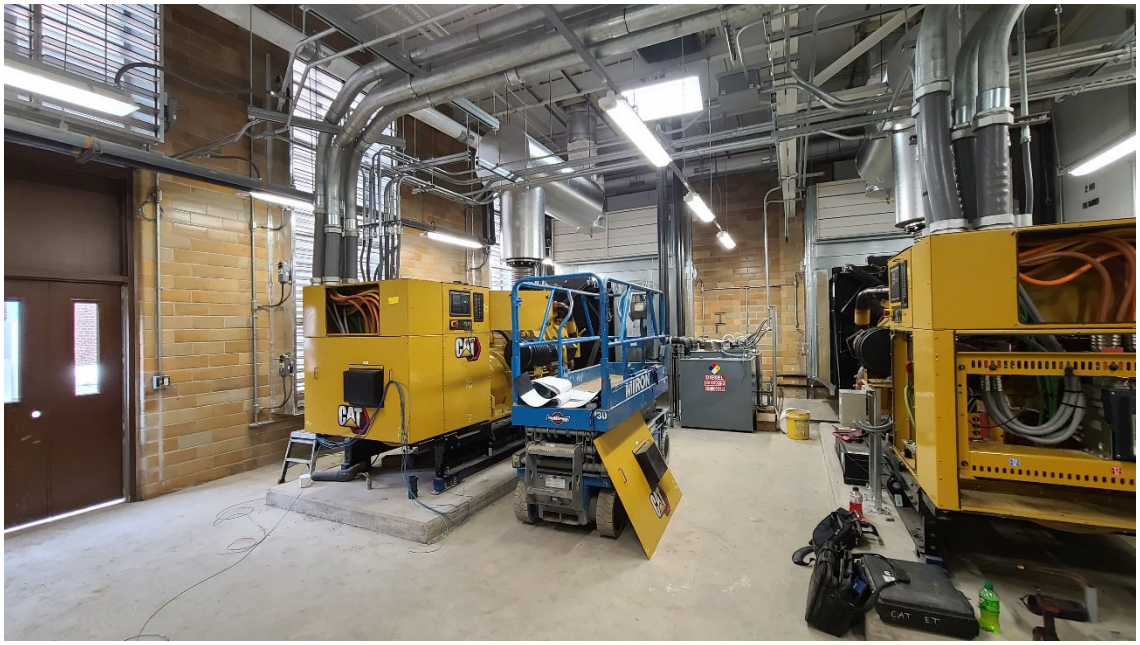
June 2021

Van Ert Electric pulling main wire into electric manhole 2, stoop work for east doorways also in progress

Storm water installation between Structure 540 (Secondary Clarifier 4) and Structure 770 (Solids Building).

New sidewalk and exterior doors south side of Structure 100 (Main Building and the start of grading between Structure 100, Structure 105 (Standby Fuel Tank) and Structure 310 (Primary Clarifier 1).

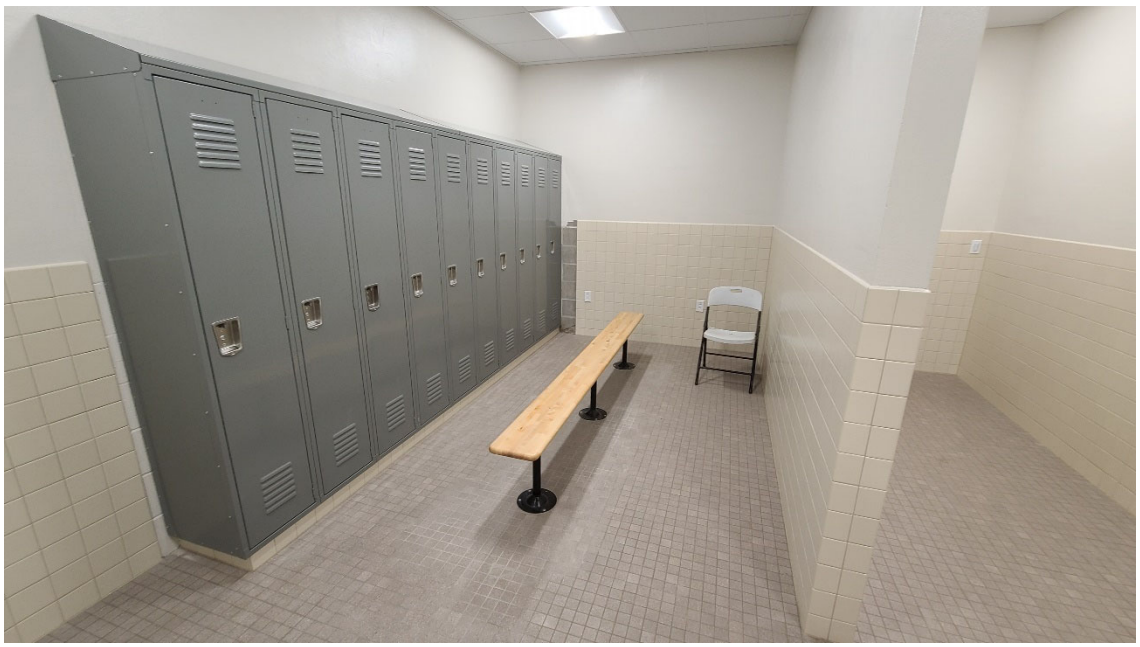
New main feed transformers set on west side of Structure 100 (Main Building).



Structure 100 (Main Building): new generators in generator room.

Van Ert Electric getting the new switchgear ready in Structure 100 (Main Building)

Front walkway and landscaping at Structure 120 (Administration Building).



Men's locker room lockers and bench have been installed in Structure 120 (Administration Building).

West extension of Structure 200 (Grit Building): new concrete masonry unit (CMU) wall with the start of brick work.

Roof penetrations and HVAC work started Structure 200 (Grit Building

Structure 310 (Primary Clarifier 1) has had hand rail removed and the top foot of the tank removed.

Formwork in place to pour new top for Structure 310 (Primary Clarifier 1).

Conduit for new north blower and harmonic filter at Structure 400 (Activated Sludge Building).

Return activated sludge piping from Tunnel 900 placed below eventual new channel slab.

New channel slab placed to eventually tie Structure 405 (Anoxic Selector Tank) to Structure 410 (Activated Sludge Basins).

West gate removed from Activated Sludge Basin 6.

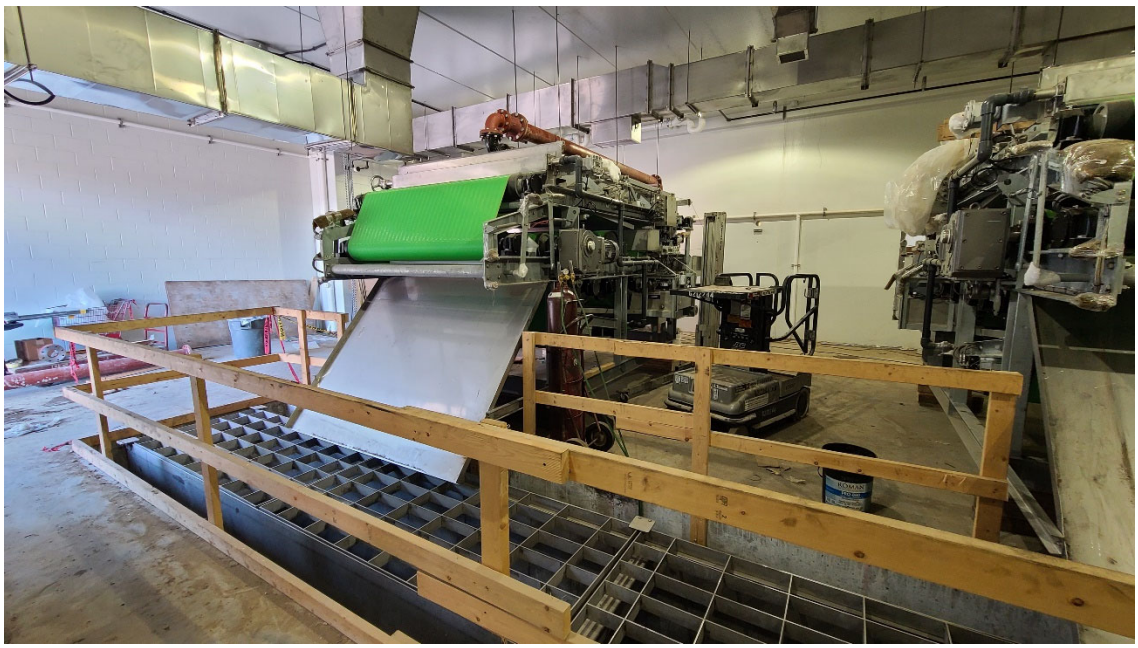
East weir being prepared for removal on Activated Sludge Basin 6.

August Winters starting on placement of internals of the clarifier as well as the weir plates for the trough at Structure 540 (Secondary Clarifier 4).

Van Ert Electric installing the new VFDs and harmonic filters in the Structure 610 (Chemical Building) electrical room.

Heating water supply and return piping to Structure 710 (Digester 1) heat exchanger.

Removal of Strcture 720 (Digester 2) roof.



Structure 770 (Solids Building) belt filter press set with chute to cake hopper.

Electrical room of Structure 770 (Solids Building) with switchgear pad layout, new VFDs hung and main feed lines pulled.

New control room area lab case work set in Structure 770 (Solis Building).

Looking down from catwalk of Structure 770 (Solids Building) at the west side of the new dryer and condenser tank.

Structure 770 (Solids Building) upper mechanical room, showing desiccant dryers and air compressors with associated receiver tank

New return activated sludge pumps and associated piping in lower level of Structure 770 (Solids Building).

New cake hopper progressive cavity pumps in the lower level of Structure 770 (Solids Building).

Structure 775 (PSD Thickener) internal mechanical equipment set and equipment access walkway placed.

Looking north, new pipe racks and piping being placed along east wall (right) of Tunnel 900.

North end of tunnel looking south down Tunnel 910 with electrical conduit runs overhead.

Parting Shots: at least he has safety orange on while foraging for worms outside of Structure 400 (Mixing Tank) and Duct Bank Q!

INVOICE

DONOHUE

3311 Weeden Creek Road
Sheboygan, WI 53081
Phone: 920-208-0296
www.donohue-associates.com

Invoice To:

City of Wausau
Attn: Dave Erickson
407 Grant Street
Wausau, WI 54403

Invoice Date:	July 8, 2021
Donohue Project No.:	13229
Invoice No:	13229-49
Project Manager:	Mike Gerbitz
Terms:	Net 30 Days
Billing Period:	06/06/21 - 07/03/21

Project Description: Wastewater Facilities Plan & Design

Your Authorization:
Engineering Services Agreement, Signed 03/29/17
Amendment No. 1, Signed 06/28/18
Amendment No. 2, Signed 03/05/19
Amendment No. 3, Signed 01/27/20
Amendment No. 4, Signed 05/07/20
Permit Review Fees Payment Request, 02/27/20

Compensation:

Time and Expense		$ 129,220.00
Time and Expense		$ 984,565.00
Time and Expense		$ 3,323,900.00
Time and Expense		$ 4,351,831.00
Time and Expense		$ 1,843,325.00
Permit Review Fees		$ 12,534.50
	Total	$ 10,645,375.50

Billing Summary:

Total Charges to Date		$ 6,260,387.08
Charges Previously Billed		$ 6,094,690.99
Current Charges		$ 165,696.09

Summary of Current Charges

Labor (1058.0 hours)		$ 156,595.00
Reimbursable Expenses		$ 2,722.09
Permit Review Fees		$ -
Subconsultants		$ 6,379.00
	Total	$ 165,696.09

Current Charges Due	**$ 165,696.09**

Please Remit to:

Donohue & Associates, Inc.
3311 Weeden Creek Road
Sheboygan, WI 53081
Phone: 920-208-0296
Fax: 920-208-0402

Aged Receivables

Current	31 - 60 Days	61 - 90 Days	91 - 120 days	>120 days
$165,696.09	$131,888.67	$0.00	$0.00	$0.00

Department of Public Works

Eric Lindman, P.E.
Director of Public Works and Utilities

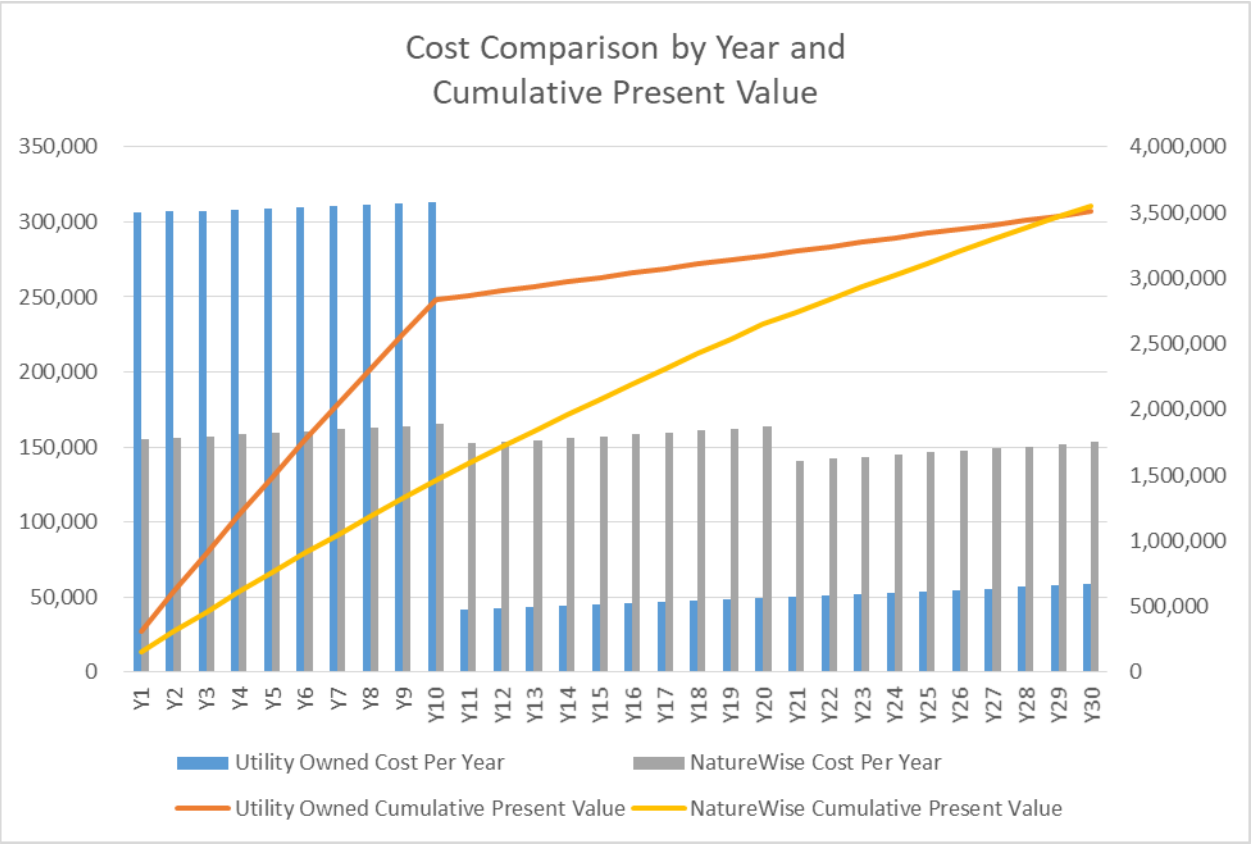
TO: Wausau Waterworks Commission

FROM: Eric Lindman, P.E.
Director of Public Works & Utilities

DATE: August 3, 2021

SUBJECT: Solar – Utility Owned vs. WPS Owned

I had a meeting with WPS to draft two agreements for the commission's review. One agreement is for the purchase of the NatureWise power and the other is for WPS to lease the utilities land and construct a solar array as well as own and operate the array. Based on the draft agreements the cost comparison was updated and shown in the graph. Costs for both options over 30 years are very similar. The significant change that was made from previous scenarios was the utility will be purchasing 1 million kWh of NatureWise versus the previous amount of 1.5 million kWh. This is the minimum amount the utility will need to purchase but as the premium decreases we can always purchase additional.



The costs presented make assumptions over a 30 year time frame that may change. Based on the information we know now and the best assumptions we can make with the data we have the options are very similar in cost. The assumptions on the NatureWise program are very conservative, we are assuming the premium cost will remain and not decrease, WPS feels this premium will decrease over time as the power industry is heavily investing in alternative energy generation. Staff also feels alternative energy premiums will decrease over time as there is significant pressure to reduce emissions.

Based on the comparison of costs, the maintenance and operation of the facility staff is recommending the utility move forward with executing the agreements with WPS. According to the agreements WPS will lease land from the city, design, build, own and operate the solar array for 30-years. The utility will be committing to purchasing a minimum of 1 million kWh of power annually from the NatureWise program. The DRAFT Agreements attached are being reviewed by legal and if the commission is supportive of these agreements they will be brought to council for final approval once legal review is complete.

SCHEDULE NAT AGREEMENT
WISCONSIN PUBLIC SERVICE CORPORATION

This Agreement pursuant to Wisconsin Public Service Corporation's ("Company") Schedule NAT is entered into between City of Wausau ("Customer") and Company.

Deleted: ____

Deleted: _____

WHEREAS, Company offers the NatureWise® program consistent with its philosophy of encouraging innovation and energy conservation and being a steward of the environment; and

WHEREAS, Customer wishes to purchase NatureWise® to further its goals of encouraging innovation and energy conservation and being a steward of the environment;

NOW, THEREFORE, in consideration of the covenants and agreements contained in this Agreement, Company and Customer agree as follows:

1. **Tariff.** This Agreement is subject to Company's electric rate book ("Tariff"), including Schedule NAT, on file with and approved by the Public Service Commission of Wisconsin, as the Tariff may be revised from time to time. The Tariff is incorporated in and made a part of this Agreement. In the event of any conflict between this Agreement and Company's Tariff, Company's Tariff will govern.

2. **Eligibility.** Customer is eligible for service under Schedule NAT.

3. **Rate.** The rate for the service Company provides Customer will be determined under the Tariff, including the charge(s) set forth in Schedule NAT.

4. **Term.**

   a. Service under this Agreement will begin July 1, 2022 and end June 30, 2042 inclusive of the beginning and ending days. {Note: dates are illustrative only, term is for 20 years}

   b. This Agreement will terminate if at any time: (i) Customer ceases to take service from Company under an Eligible Rate Schedule, (ii) Company no longer offers Schedule NAT.

   c. Upon termination, neither party will have any liability to the other except for payment of amounts due and owing upon termination.

5. **Customer.** Customer will purchase Schedule NAT service for the following account(s):

Service Address(es)	Account Number(s)
1801 Bugbee Avenue	

6. **Quantity of Service.** Customer will purchase 834 renewable energy blocks per month during the Term. A "block" is 100 kWh.

Deleted: 1,250

7. **Environment.**

a. Company and Customer agree that the service that Company provides and Customer purchases under Schedule NAT encourages the development of additional renewable energy resources. They also agree that the service conveys no contractual rights to any Environmental Attributes. "Environmental Attributes" means the credits, off-sets, payments, rights, attributes, tags, green tags or other derivative benefits of any kind, whether arising under or associated with currently-existing state and federal laws or programs or state and federal laws or programs that may be established, enacted or promulgated in the future, associated with or arising out of or otherwise corresponding to the production, purchase, sale, use, transmission, or distribution of energy under this Agreement.

b. Except as set forth in Schedule NAT, Company makes no representations or warranties about the source or environmental characteristics of the energy it is selling under this Agreement, nor about the quantitative impact on the environment of the sale of such energy.

8. **Third Party Beneficiary.** Company and Customer agree that there is no third party beneficiary of this Agreement and this Agreement does not impart enforceable rights to anyone who is not a party.

9. **Imaged Agreement.** The parties may photocopy and store on computer tapes and disks the original executed Agreement or other related document (the "Imaged Agreement"). The Imaged Agreement, if introduced as evidence on paper in any judicial, arbitration, mediation or administrative proceedings, will be admissible as between the parties to the same extent and under the same conditions as other business records originated and maintained in documentary form.

IN WITNESS WHEREOF, Company and Customer have each caused this Agreement to be executed by an authorized person.

NAME OF CUSTOMER Customer	Wisconsin Public Service Corporation Company
By:	By:
Name: Katie Rosenberg	Name:
Title: Mayor	Title:
Date:	Date:

SOLAR GROUND LEASE AGREEMENT

THIS SOLAR GROUND LEASE AGREEMENT (this "Lease") is made and entered into as of the ___ day of _____, _____ (the "Effective Date"), by City of Wausau, a municipal corporation of the State of Wisconsin ("Landlord"), and Wisconsin Public Service Corporation ("Tenant"). Landlord and Tenant are at times collectively referred to hereinafter as the "Parties" or individually as the "Party."

W I T N E S S E T H:

A. Landlord is the owner of that certain property located at 1010 Bugbee Avenue, and further legally described in Exhibit A attached hereto (the "Property"). and

B. Landlord (as "Customer") and Tenant (as "Company") have agreed to enter into a renewable energy purchase agreement (the "Schedule NAT Agreement") whereby Landlord will purchase a minimum of 1,000,000 kWh annually of renewable energy from Tenant under Tenant's NatureWise program ("Service Agreement"). and

C. Landlord desires to host a Tenant-owned approximately 1,000 kW nameplate capacity electric power generating photovoltaic solar panel array and connector equipment (such as wires, cabling, pipes, conduit, inverters, mounting, trackers, controls and associated equipment) on the Property (all of the foregoing collectively, the "PV System"). and

D. Tenant desires to lease from Landlord and Landlord desires to lease to Tenant, certain areas of the Property as further specified herein for purposes of installing, operating, maintaining and repairing the PV System, all on the terms and conditions hereinafter provided.

NOW, THEREFORE, in consideration of the premises and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. Lease. Landlord hereby leases to Tenant, during the Term hereof and subject to the restrictions set forth herein, those portions of the Property constituting approximately 341,389 sq ft (7.84) acres of land that are described on Exhibit B attached hereto and made a part hereof (the "Premises"), for the purposes of installing, operating, maintaining, repairing and removing the PV System. Subject to the terms and conditions set forth in this Lease, Tenant shall have the right to use the Premises for the installation, operation, maintenance, repair and removal of the PV System, as such PV System is more particularly described on Exhibit C attached hereto and made a part hereof.

2. Term.

(a) The initial term of this Lease (the "Initial Term") shall begin on the Effective Date and shall end on the last day of the calendar month that includes the **thirtyieth (30th)** anniversary of the Rent Commencement Date (as defined below).

Deleted: __
Deleted: _____
Deleted: _
Deleted: _____
Deleted: __
Deleted: _____,
Deleted: _____
Deleted: (commonly known as ____ [if applicable for schools/site clarification])
Deleted: 5
Deleted: _____
Formatted: Highlight
Deleted: _
Formatted: Highlight
Deleted: _____

(b) Tenant shall have two (2) options to extend the Initial Term for periods of sixty (60) consecutive months ("Renewal Terms"), exercisable in accordance with the terms of this Section 2(b). Provided Tenant is not in default under any of its obligations under this Lease (after the expiration of all applicable notice and cure periods), at the end of the Initial Term, Tenant may elect to extend the Initial Term for a period of sixty (60) consecutive months (First Renewal Term), or if after the first Renewal Term, Tenant may elect to extend the Term of this Lease for a second Renewal Term. Such an extension shall be made by delivery by Tenant to Landlord of written notice of Tenant's election to renew at least three (3) months prior to the end of the then existing Initial Term or First Renewal Term, as the case may be. Rent for each Renewal Term shall be determined in accordance with the procedure set forth in Exhibit D. If Tenant fails to timely exercise either option to extend the Term, Tenant shall be deemed to have waived all of its rights under any unexercised extension options, and thereafter, such extension options shall be null and void and of no further effect.

(c) In the event that prior to the Rent Commencement Date Tenant determines, in Tenant's sole discretion, that the Premises are not suitable for the installation and operation of the PV System, Tenant may terminate this Lease by providing written notice of such termination to Landlord.

3. Rent. In consideration of the rights granted hereunder, beginning on the date (the "Rent Commencement Date") on which Tenant, under the Service Agreement, first furnishes electricity under the NatureWise program, Tenant shall pay to Landlord rent ("Rent") in the amount specified in Exhibit D attached hereto and made a part hereof and payable as set forth in Exhibit D. In the event of any failure by Landlord (as "Customer") to pay Tenant (as "the Company") any rates or other compensation due under the Service Agreement, during the time of such non-payment Tenant shall not be obligated to pay Rent under this Lease.

4. Easements.

(a) Access. Landlord hereby grants to Tenant, and its agents and contractors, during the Term, non-exclusive easements over, across and through areas of the Property surrounding the Premises (as reasonably designated by Landlord from time to time) for ingress and egress to and from the Premises at all times (including parking related to Tenant's use of the Premises), and for the installation, maintenance, repair, replacement and removal of the PV System and related equipment (including construction laydown and related activities).

(b) Sunlight and Solar Energy. Landlord hereby grants to Tenant, during the Term, an exclusive easement over and across the Premises and surrounding Property for the unobstructed passage of sunlight to the photovoltaic panel systems within the PV System (the "Panels"), and for the capture, use and conversion of the unobstructed flux of solar energy over and across the Premises and the Property from all angles from sunrise to sunset during each day of the Term. Without limiting the generality of the foregoing, Landlord specifically agrees not to construct, plant or allow any construction or plantings on or about the Premises or surrounding Property which block sunlight from reaching the Panels.

(c) Effects. Landlord hereby grants to Tenant, during the Term, an exclusive easement over and across the Premises and surrounding Property for electromagnetic, audio,

visual, view, light, noise, vibration, electrical, radio interference and/or other effects attributable to the PV System.

(d) Interconnection, and Utilities. Landlord hereby grants to Tenant, and its agents and contractors, during the Term, non-exclusive easements over, across and through the Premises and surrounding Property for the installation, maintenance, repair, replacement and removal of interconnection facilities such as wires, cabling and similar facilities and for utilities required for the operation of the PV System and the connection of the PV System to Tenant's electrical distribution system (all of the foregoing collectively, the "Interconnection Facilities"). The locations for such Interconnection Facilities shall be as shown in Exhibit C or as mutually agreeable to Landlord and Tenant.

(e) Distribution. Landlord hereby grants to Tenant, and its agents and contractors, perpetual non-exclusive easements over, across and through those portions of the Premises and surrounding Property that are depicted on a preliminary map attached as Exhibit E. A final mutually agreed upon easement ("Final Easement") describing these facilities under this paragraph (e) for the installation, maintenance, repair, replacement and removal of overhead and underground facilities for Tenant's electrical distribution system will be provided to Landlord upon completion of Tenant's final design. The Final Easement shall replace Exhibit E.

(f) Cooperation. Tenant's activities under the easements described in this Section 4 shall not unreasonably interfere with Landlord's normal business activities on the Property (excluding the Premises), and the Parties will cooperate to establish reasonable policies and procedures, consistent with Tenant's internal rules and regulations, applicable industry standards and prudent utility practices, for the ongoing maintenance, repair and operation of Tenant's PV System.

5. Additional Terms and Conditions. In addition to the other terms of this Lease, the rights and obligations herein shall be subject to the following terms and conditions:

(a) Tenant shall be solely responsible for installing, operating, maintaining and repairing the PV System, at Tenant's sole cost and expense in a good and workmanlike manner (provided that if the need for any such repairs is due to damage caused by Landlord or any of its agents, employees or contractors, Landlord shall reimburse Tenant for the reasonable cost of such repairs within ten (10) days after Landlord's receipt of a written invoice therefor from Tenant).

(b) In the event that any fees, taxes, charges, impositions or levies are assessed against the PV System and/or the Premises by any governmental authority as a result of the installation and operation of the PV System on the Premises, Landlord and Tenant shall cooperate in good faith to mutually determine a reasonable allocation of such liability.

(c) Tenant shall pay for all utility services related to Tenant's use of the Premises as described hereunder.

(d) Tenant shall keep and maintain the PV System and the Premises reasonably free of debris and trash.

(e) Landlord shall not directly or indirectly allow any lien on or with respect to Property or PV System by, through or under Landlord.

(f) Tenant shall not directly or indirectly allow any lien on or with respect to the Premises or PV System by, through or under Tenant.

6. Modifications to Premises. Any modifications to the Premises in connection with the rights granted to Tenant hereunder shall be made in accordance with any and all applicable governmental guidelines, laws, ordinances, codes, rules, regulations and requirements of all federal, state or local governmental units or agencies having jurisdiction over the Premises (collectively, "Laws") in effect from time to time.

7. Licenses, Permits, Laws and Rules. Tenant shall secure and maintain throughout the Term of this Lease from the proper governmental authorities all licenses or permits required by applicable Laws for the installation, location, maintenance and operation of the PV System on the Premises. Tenant shall, at Tenant's sole cost and expense, promptly observe and comply with any and all Laws, as such Laws may relate to the use, location, maintenance or operation of the PV System. Landlord shall provide reasonable cooperation and assistance to Tenant in obtaining all governmental approvals required by Tenant.

8. Maintenance of the Premises. Tenant shall maintain the Premises in a state of good condition and repair in accordance with all Laws, and Landlord shall maintain the remainder of the Property in a state of good condition and repair in accordance with all Laws; provided, however, that Tenant shall, at Tenant's expense, promptly repair any damage to the Property to the extent such damage is caused by Tenant or any of its employees, agents or contractors, and Landlord shall, at Landlord's expense, promptly repair any damage to the Premises to the extent such damage is caused by Landlord or any of its employees, agents or contractors. To the extent that any repairs or replacements of the Premises are Landlord's responsibility and are necessary during the Term hereof, Landlord shall promptly notify Tenant thereof, and shall coordinate such repairs or replacements with Tenant so as to not interfere with Tenant's exercise of its rights hereunder.

9. Default and Remedies.

(a) In the event of any breach of any provision of this Lease by Tenant, which breach shall remain uncured for thirty (30) days after written notice thereof to Tenant (or such longer period of time, in the event that such cure will reasonably take longer than thirty (30) days, so long as Tenant begins the cure during such thirty (30)-day period and diligently pursues completion of the same thereafter), Landlord may declare Tenant to be in default hereunder and may terminate this Lease. In addition, Landlord shall be entitled to exercise all available rights and remedies at law or in equity as a result of such default; provided, however, that in no event shall Landlord be entitled to receive consequential, special or punitive damages as a result of a default under this Lease by Tenant.

(b) In the event of any breach of any provision of this Lease by Landlord, which breach shall remain uncured for thirty (30) days after written notice thereof to Landlord (or such longer period of time, in the event that such cure will reasonably take longer than thirty (30) days, so long

as Landlord begins the cure during such thirty (30)-day period and diligently pursues completion of the same thereafter), Tenant may declare Landlord to be in default hereunder and may terminate this Lease. In addition, Tenant shall be entitled to exercise all available rights and remedies at law or in equity as a result of such default; provided, however, that in no event shall Tenant be entitled to receive consequential, special or punitive damages as a result of a default under this Lease by Landlord.

10. Sale of PV System; Surrender of Premises; Removal of PV System. Not later than one (1) year prior to the end of the Initial Term, or the end of any Renewal Term if applicable, Landlord and Tenant will begin good faith negotiations regarding the possible sale (or other mutually agreeable disposition) of the PV System, for fair market value, to Landlord. In the event that Landlord and Tenant are not able to agree upon the terms and conditions for a sale or other disposition of the PV System to Landlord by the end of the Initial Term, or the end of any Renewal Term if applicable, or in the event of any early termination of this Lease, upon such expiration or termination Tenant shall have ninety (90) days (subject to reasonable extension in the event of adverse weather conditions) to decommission and remove the PV System and any related property from the Premises (except for the Interconnection Facilities, which may be abandoned in place) and restore the surrounding area where such PV System was located to the condition existing prior to the installation of the PV System (reasonable wear and tear and customary commercial facility degradation excepted). Such decommissioning, removal and restoration shall be at Tenant's expense, unless the Lease has been terminated as a result of a default by Landlord (in which event Landlord shall bear the costs of such decommissioning, removal and restoration).

11. Indemnification.

(a) Landlord shall indemnify, defend and hold Tenant, and Tenant's officers, agents, contractors and employees, harmless from and against any and all losses, injuries, damages, demands, costs, expenses, fines, penalties, lawsuits, claims and/or liabilities (including reasonable attorneys' fees), occasioned by, arising out of or resulting in connection with, this Lease, Landlord's activities at or from the Property, any act or failure to act by Landlord, its officers, agents, contractors, employees or invitees, or any default by Landlord hereunder, except to the extent arising from the negligence or willful misconduct of Tenant or its officers, agents, contractors, employees or invitees.

(b) Tenant shall indemnify, defend and save Landlord, and Landlord's officers, agents, contractors and employees, harmless from and against any and all losses, injuries, damages, demands, costs, expenses, fines, penalties, lawsuits, claims and/or liabilities (including reasonable attorneys' fees), occasioned by, arising out of or resulting in connection with, this Lease, Tenant's activities at or from the Premises, any act or failure to act by Tenant, its officers, agents, contractors, employees or invitees, or any default by Tenant hereunder, except to the extent arising from the negligence or willful misconduct of Landlord or its officers, agents, contractors, employees or invitees.

12. Insurance.

(a) Tenant shall carry or cause to be carried the following insurance during the entire Term hereof:

(i) Commercial general liability insurance, including contractual liability insuring the indemnification provisions contained in this Lease, in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; naming Landlord as an additional insured; and

(ii) Automobile liability insurance in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; naming Landlord as an additional insured; and

(iii) Workers compensation and employer's liability insurance with statutory limits and employer's liability in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; and

(iv) Umbrella/Excess liability insurance in an amount of not less than Two Million and 00/100 Dollars ($2,000,000.00) per occurrence; and

(v) "All Risk" property insurance for the full replacement cost of the PV System and all additions, improvements and alterations to the Premises and all other items of Tenant's property at or in the Premises.

Alternatively, Tenant may self-insure for the risks described in this Section 12(a).

(b) Landlord shall carry or cause to be carried the following insurance during the entire Term hereof:

(i) Commercial general liability insurance, including contractual liability insuring the indemnification provisions contained in this Lease, in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; naming Tenant as an additional insured; and

(ii) Automobile liability insurance in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; naming Tenant as an additional insured; and

(iii) Workers compensation and employer's liability insurance with statutory limits and employer's liability in an amount of not less than One Million and 00/100 Dollars ($1,000,000.00) per occurrence; and

(iv) Umbrella/Excess liability insurance in an amount of not less than Two Million and 00/100 Dollars ($2,000,000.00) per occurrence; and

(v) "All-Risk" property insurance for the full replacement cost of the Landlord's surrounding Property. (and any buildings or other improvements thereon), including coverage to protect against loss of rents.

(c) Each Party shall, prior to the commencement of the Term hereof and thereafter upon annual request during the Term, furnish certificates of insurance evidencing the coverages required hereunder. Tenant's obligations under this Section 12(c) shall not apply to the extent that Tenant self-insures.

(d) Landlord and Tenant and all parties claiming under them hereby mutually waive the right of subrogation against the other Party.

13. Damage or Destruction. In the event the Premises shall be partially or totally destroyed by fire or other casualty so as to become partially or totally unfeasible for use by Tenant hereunder, the damage shall be promptly repaired by Landlord, and a just and proportionate part of the Rent and all other additional rent and charges shall be abated until so repaired; provided, however, that if more than ten percent (10%) of the Premises shall be damaged or destroyed by fire or other casualty, then Tenant shall have the option to terminate this Lease by giving written notice to Landlord of its election to so terminate within thirty (30) days after Tenant's receipt of notice of the fire or other casualty.

14. Eminent Domain. If all or substantially all of the Premises is taken by any public authority under its power of condemnation or the threat thereof, this Lease shall terminate as of the date possession shall be transferred to the acquiring authority, and the Rent and all other additional rent and charges payable hereunder shall be apportioned accordingly. If any material part of the Premises is taken, then Tenant shall have the right to terminate this Lease as of the date possession is transferred to the acquiring authority, upon giving written notice thereof to Landlord, and the Rent payable hereunder shall be apportioned accordingly. Upon any taking of less than substantially all of the Premises (unless this Lease is terminated by Tenant as provided herein), this Lease shall continue in force as to the part of the Premises not taken, and the Rent payable thereafter shall be reduced in proportion to the amount of total area of the Premises taken. In the event of any such taking, Landlord, upon receipt and to the extent of the award in condemnation or proceeds of sale, shall, unless this Lease has been terminated, make necessary repairs and restorations to restore the Premises remaining to as near its former condition as circumstances will permit. Any damages awarded by or amounts paid by the acquiring authority for any such taking, whether for the whole or a part of the Premises, shall belong to Landlord; provided, however, that Tenant shall have the right to pursue such claim or claims as Tenant may have legally for relocation expenses, interruption of business and such items which do not reduce the award or proceeds of sale payable to Landlord; and further provided that to the extent that Tenant incurs any cost or damage due to the loss of expected depreciation related to the PV System as a result of such taking, then Landlord shall reimburse Tenant for such cost or damage (as reasonably estimated by Tenant) within thirty (30) days after Landlord's receipt of the award of damages or other compensation from the acquiring authority.

15. Assignment/Subletting.

(a) Tenant shall have the right to assign its interest in this Lease and the leasehold estate created hereby upon written notice to Landlord, provided that any such assignee agrees in writing to assume and perform the obligations of Tenant under this Lease.

(b) Landlord shall have the right to assign its interest in this Lease and the leasehold estate created hereby in connection with a sale of the Premises, upon written notice to Tenant, provided that any such assignee agrees in writing to assume and perform the obligations of Landlord under this Lease.

16. Title to Property; Title to PV System.

(a) Landlord represents and warrants to Tenant that (i) Landlord owns the Property free and clear of any easements or other encumbrances or restrictions that could have a material adverse effect on Tenant's rights under this Lease, (ii) Landlord has full and complete authority to enter into this Lease under all of the terms, conditions and provisions set forth herein, and (iii) no approvals are required under any recorded or unrecorded documents affecting the Property for the construction of the PV System or Tenant's use of the Premises for the purposes described in Section 1 above.

(b) Notwithstanding the PV System's presence and operation on the Premises, Tenant shall at all times retain title to and be the legal and beneficial owner of the PV System and all alterations, additions or improvements made thereto by Tenant, and the PV System shall remain the property of Tenant or Tenant's assigns, and Tenant shall have the right to remove the PV System from the Premises in accordance with the terms of this Lease. In no event shall anyone claiming by, through or under Landlord (including but not limited to any present or future mortgagee of the Premises and/or surrounding Property) have any rights in or to the PV System at any time, except as otherwise provided in this Lease. Landlord shall not cause the PV System or any part thereof, to become subject to any lien, encumbrance, pledge, levy or attachment arising by, under or through Landlord, and Landlord will promptly, at its expense, take such action as may be necessary to duly discharge any such lien, encumbrance, pledge, levy or attachment if the same shall arise at any time

17. Estoppel; Non-Disturbance Agreement.

(a) Landlord and Tenant each agree, within ten (10) days after request therefor by the other Party, to execute in recordable form and deliver to the requesting Party a statement, in writing, certifying (if such be the case) (i) that this Lease is in full force and effect, (ii) the date of commencement of the Term, (iii) that Rent is paid currently without any off-set or defense thereto, (iv) the amount of Rent, if any, paid in advance, (v) that there are no uncured defaults by the requesting Party or, if such defaults are claimed, stating the facts giving rise thereto, and (vi) other similar matters as may be requested by the requesting Party or its lenders, mortgagees or prospective mortgagees. Any such certificate may be relied upon by the Party requesting it and any other person, firm or corporation to whom the same may be exhibited or delivered, and the contents of such certificate shall be binding on the Party providing it.

(b) Landlord represents to Tenant that the Premises is not subject to any mortgages, deeds of trust, security instruments, ground leases, easement agreements, trust agreements, covenants, conditions or restrictions (collectively, "Superior Interests") and Landlord covenants that if Landlord desires to subject the Premises to a Superior Interest, Landlord shall notify Tenant in writing and shall obtain a non-disturbance agreement reasonably satisfactory to Tenant from the holder of any such Superior Interest. Such non-disturbance agreement shall provide that, in the event of any proceedings brought for the enforcement of any Superior Interest, Tenant shall, upon demand by the Superior Interest holder but subject to Tenant's rights of non-disturbance, attorn to and recognize such Superior Interest holder as Landlord under this Lease.

18. Marketing. Tenant shall have the exclusive right to own and operate the PV System during the Term. In the event that marketing rights are sold to a third party, Tenant reserves the right to view and approve the content of such third party's marketing program related to the PV System, such approval not to be unreasonably withheld. In addition, Tenant reserves the right to market that the Customer is a participant in the "NatureWise" program through a mutually agreeable joint press release. Customer acknowledges that Tenant may use Customer's business name and/or website address in NatureWise promotional materials, and Tenant will provide the Customer with public recognition of Customer's commitment to renewable energy under the NatureWise program.

19. Notice. Any notice, request, demand, instruction or other communication to be given to any Party hereunder shall be in writing and hand delivered or sent by overnight courier or registered or certified mail, return receipt requested, as follows:

To Landlord: _City of Wausau_____
_407 Grant Street_____
_Wausau, WI 54403_____
Attn: _Katie Rosenberg, Mayor_____

To Tenant: Wisconsin Public Service Corporation
_____
_____
Attn: _____

Deleted: __
Formatted Table
Deleted: ___
Deleted: ____
Deleted: _____

Either Party may, upon prior notice to the other, specify a different address for the giving of notice. Except as otherwise provided herein, if delivered in person, the notice shall be deemed given when received. If sent by overnight courier, the notice shall be deemed to have been given one (1) day after sending. If mailed, the notice shall be deemed to have been given on the date that is three (3) business days following mailing. Either Party may change its address by giving written notice thereof to the other Party.

20. Quiet Enjoyment. If and so long as Tenant pays the Rent reserved by this Lease and performs and observes the covenants and provisions hereof, Landlord covenants and agrees that Tenant shall quietly enjoy the exercise of its rights hereunder without hindrance, disturbance or molestation from Landlord or any person claiming by, through or under Landlord.

21. Waiver. Failure or delay on the part of Landlord or Tenant to exercise any right, power or privilege hereunder shall not operate as a waiver thereof.

22. Prior Negotiations. This Lease constitutes the entire agreement of the Parties with respect to the subject matter hereof and shall supersede all prior offers, negotiations and agreements in connection herewith.

23. Amendment. No modification of this Lease shall be valid unless made in writing and signed by an authorized officer of Landlord and an authorized officer of Tenant.

24. **Governing Law and Waiver of Jury.** THIS LEASE SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF WISCONSIN, WITHOUT REGARD TO PRINCIPLES OF CONFLICTS OF LAW. THE PARTIES HEREBY IRREVOCABLY SUBMIT TO THE NON EXCLUSIVE JURISDICTION OF ANY STATE OR FEDERAL COURT IN WISCONSIN WITH RESPECT TO ANY ACTION OR PROCEEDING ARISING OUT OF OR RELATING TO THIS LEASE. EACH PARTY HERETO IRREVOCABLY AND UNCONDITIONALLY WAIVES TRIAL BY JURY IN ANY ACTION, SUIT OR PROCEEDING RELATING TO A DISPUTE AND FOR ANY COUNTERCLAIM WITH RESPECT THERETO.

25. **No Partnership**. Neither Party, by virtue of this Lease, in any way or for any purpose, shall become a partner of the other Party in the conduct of its business, nor become a joint venturer or a member of a joint enterprise with the other Party, nor become responsible for any of the debts, liabilities or obligations of the other Party.

26. **Headers and Captions.** The Section headings in this Lease are inserted only as a matter of convenience in reference and are not to be given any effect whatsoever in construing any provision of this Lease.

27. **Successors and Assigns.** The covenants and agreements contained in this Lease shall run with the land as to the Property and shall apply to, inure to the benefit of, and be binding upon the Parties hereto and upon their respective permitted successors and assigns, except as expressly otherwise herein provided.

28. **Severability.** If any term, covenant or condition of this Lease or any portion of any term, covenant or condition hereof or the application thereof to any person, entity or circumstance shall, to any extent, be invalid or unenforceable, the remainder of this Lease, or the application of such term, covenant or condition or portion thereof to persons, entities and circumstances other than those as to which it is held invalid or unenforceable, shall not be affected thereby, and each term, covenant and condition of this Lease and each portion thereof shall be valid and be enforced to the fullest extent permitted by law.

29. **Construction.** This Lease shall not be construed more strictly against one Party than against the other merely by virtue of the fact that it may have been prepared by counsel for one of the Parties. Words of any gender in this Lease shall be held to include any other gender and words in the singular number shall be held to include the plural where the sense requires. Unless otherwise specified in this Lease, any reference to "days" shall be construed as a reference to calendar days, and shall include in the counting thereof all Saturdays, Sundays and holidays; provided, however, if the final day of any period specified in "days" falls on a Saturday, Sunday or holiday, the period shall be deemed extended to include the next regular business day occurring thereafter.

30. **Memorandum for Recording.** Upon the request of either Landlord or Tenant, the parties shall record a memorandum of this Lease with the Register of Deeds for the county in which the Property is located.

31. **Counterparts.** This Lease may be executed in counterparts, each of which shall be deemed to be an original, but all of which together shall constitute one and the same instrument.

[Signatures appear on the following page.]

IN WITNESS WHEREOF, Landlord and Tenant have executed this instrument as of the day and month first above written.

LANDLORD:

City of Wausau

By:_____
Name/Title: Katie Rosenberg, Mayor

Customer Tax ID: 39-6005648

TENANT:

WISCONSIN PUBLIC SERVICE CORPORATION

By:_____
Name/Title:_____

EXHIBIT A

Legal Description of Property

OWNER NAME AND MAILING ADDRESS

PROPERTY ADDRESS

LEGAL DESCRIPTION

Exhibit B

Description of Premises

[Surveyed map of pacel for PV System]

EXHIBIT C

PV System

[Include approximate locations for Interconnection Facilities]

EXHIBIT D

Rent

Annual Rent due and payable under this Lease during the Initial Term shall be $_800/ac__ per year. Rent shall be paid to Landlord in monthly installments equal to one twelfth (1/12th) of the annual amount. Annual Rent during the Initial Term will increase _2_% per year commencing on the anniversary date of the Rent Commencent Date.

Annual rent due and payable under this Lease during the first Renewal Term shall be $____ per year. Rent shall be paid to Landlord in monthly installments equal to one twelfth (1/12th) of the annual amount. Annual Rent during the first Renewal Term will increase __% per year commencing on the anniversary date of the Rent Commencement Date.

Annual rent due and payable under this Lease during the second Renewal Term shall be $____ per year. Rent shall be paid to Landlord in monthly installments equal to one twelfth (1/12th) of the annual amount. Annual Rent during the first Renewal Term will increase __% per year commencing on the anniversary date of the Rent Commencement Date.

EXHIBIT E

Preliminary Map of Distribution Easement

[Distribution Easements are not applicable for this site as Solar PV System will tie into existing secondary distribution facilities.]

OR

[Preliminary Map of Distribution Easements]

Department of Public Works

Eric Lindman, P.E.
Director of Public Works and Utilities

TO: Wausau Waterworks Commission

FROM: Eric Lindman, P.E.
Director of Public Works & Utilities

DATE: August 3, 2021

SUBJECT: Recruitment/Retention/Market Analysis

Over the past 4-5 years the utility has had difficulty recruiting qualified employees. The utility also has had turnover and/or retention challenges. Some of the turnover has been related to retirements and some is related to employees moving on to other jobs. The answer to recruiting over the past couple years was reducing the minimum qualifications for the job so we could get people to apply and get people to qualify for an interview. We are at the point now our positions require a high school diploma and the ability to get a CDL within a year once hired. This requires extensive training and time from our existing staff. At the streets division we ran an analysis about 3-years ago that we spend about $10,000 - $12,000 per year for the first two years in training new inexperienced employees. This training is for the CDL and other very basic knowledge of the position. At the utility these costs would be the same or higher as we require all of our staff to rotate on-call weeks and this requires additional training and experience. This cost will go up when the Federal Motor Carrier Safety Administration implements its new CDL requirements in February of 2022. When we hire employees and they leave within 18-24 months we have a lot of time and money vested in them which is lost so staff has been looking at solutions for retention.

Wages and compensation is always a reason for employees to take positions and to leave positions. There may be other reasons employees leave but money is almost always part of this consideration. Some utilities in WI and other states have done the following to retain employees:

- Pay for the employees' health care premium
- Contribute a match percentage to the employees investments
- Pay for gym memberships
- Pay for daycare or a portion there of
- Higher on-call pay premiums
- Or a combination of some of the above

Currently, as was implemented in 2019, we are on a stepped wage scale and every year employees, who satisfactorily meet expectations, get a Step increase. If they are below mid-point it is 3% and above mid-point it is 1.5%. I have attached the wage scale and steps for your reference. As you can see, the skilled labor force reaches mid-point or "Market Rate" at their 8th year of employment, if hired at the minimum. During the 8-years there could be wage scale adjustments that increase market rate and then the employee would need to work longer to reach mid-point or market rate.

In a skilled labor force it is difficult to retain employees in this market when it will take them 8+ years to get to today's market rate wage and there is no cost of living allowance (COLA). The city has a policy of conducting a wage study every 5-years. The last wage study began in 2016, the wages and wage structure was prepared in 2017-2018 and it was implemented in 2019. Waiting until 2024 to review wages results in the actual establishment of wages being 6-7 years old and no cost of living increases. 5-years is a long time without a COLA or any other review of where wages should be adjusted. COLA's should be reviewed and considered on a frequent basis or there should be consideration for reviewing wages more frequently. Reviewing wages and setting policy for frequency helps ensure consistency and structure for employees.

Some possible discussion points for the commission moving forward and possibilities for staff to work on and prepare:

1. Prepare an RFP and hire a consultant for a market analysis of utility wages and possible options for assisting with retention and recruitment. This would be independent from the City.
2. Consider a COLA for 2022 for the utility employees, may be independent of what the City or in line with the city of the city decides to propose a COLA for 2022.
3. City is proposing to RFP a market analysis city wide in 2022, then complete the market analysis in 2023 and implement the changes in 2024. The utility could follow this schedule or elect to implement a different schedule.
4. Consider establishing criteria for employees to reach market rate sooner than 8-years. This can be through skill testing, practical tests, etc. Based on an employee's ability they would have the potential to step through the pay scale to mid-point more quickly. Once they reach mid-point or market rate they would step through the pay scale as they do now, one step each year until they reach top end of the scale.
5. Staff may look at establishing different levels of the position. For example, there would be a Distribution maintainer I & II or Plant Mechanic I, II, III. Each of these would be a different pay grade employees would step into once qualified. The challenge with this structure is the wage study compressed all of our positions so there is not room in pay grades between our current positions. This would require significant reclassifications and position description writing.

The priority at this time is ensuring retention of employees. Getting employees to market rate sooner, especially in the skilled labor force will help in this endeavor. Since we have reduced our minimum qualifications for recruitment we need to be able to onboard people, train them and be able to keep them.

City of Wausau - Wage Scale

Job Title	Pay Grade	Min	Mid Market Rate	Max	Steps																		
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	12	$29.62	$37.02	$44.43	29.62	30.51	31.43	32.37	33.34	34.34	35.37	36.43	37.52	38.08	38.65	39.23	39.82	40.42	41.03	41.65	42.27	42.90	43.54	44.19	**$44.43**
		$61,609.60	$77,001.60	$92,414.40	61,609.60	63,460.80	65,374.40	67,329.60	69,347.20	71,427.20	73,569.60	75,774.40	78,041.60	79,206.40	80,392.00	81,598.40	82,825.60	84,073.60	85,342.40	86,632.00	87,921.60	89,232.00	90,563.20	91,915.20	**$92414.40**
	13	$27.99	$34.99	$41.99	27.99	28.83	29.69	30.58	31.50	32.45	33.42	34.42	35.45	35.98	36.52	37.07	37.63	38.19	38.76	39.34	39.93	40.53	41.14	41.76	**$41.99**
		$58,219.20	$72,779.20	$87,339.20	58,219.20	59,966.40	61,755.20	63,606.40	65,520.00	67,496.00	69,513.60	71,593.60	73,736.00	74,838.40	75,961.60	77,105.60	78,270.40	79,435.20	80,620.80	81,827.20	83,054.40	84,302.40	85,571.20	86,860.80	**$87,339.20**
	14	$26.69	$33.37	$40.04	26.69	27.49	28.31	29.16	30.03	30.93	31.86	32.82	33.8	34.31	34.82	35.34	35.87	36.41	36.96	37.51	38.07	38.64	39.22	39.81	**$40.04**
		$55,515.20	$69,409.60	$83,283.20	55,515.20	57,179.20	58,884.80	60,652.80	62,462.40	64,334.40	66,268.80	68,265.60	70,304.00	71,364.80	72,425.60	73,507.20	74,609.60	75,732.80	76,876.80	78,020.80	79,185.60	80,371.20	81,577.60	82,804.80	**$83,283.20**
	15	$25.40	$31.74	$38.09	25.40	26.16	26.94	27.75	28.58	29.44	30.32	31.23	32.17	32.65	33.14	33.64	34.14	34.65	35.17	35.70	36.24	36.78	37.33	37.89	**$38.09**
		$52,832.00	$66,019.20	$79,227.20	52,832.00	54,412.80	56,035.20	57,720.00	59,446.40	61,235.20	63,065.60	64,958.40	66,913.60	67,912.00	68,931.20	69,971.20	71,011.20	72,072.00	73,153.60	74,256.00	75,379.20	76,502.40	77,646.40	78,811.20	**$79,227.20**
Collection System Supervisor	16	$24.76	$29.71	$34.66	24.76	25.50	26.27	27.06	27.87	28.71	29.57	30.46	30.92	31.38	31.85	32.33	32.81	33.30	33.80	34.31	**$34.66**				
Water Distribution Supervisor		$51,500.80	$61,796.80	$72,092.80	51,500.80	53,040.00	54,641.60	56,284.80	57,969.60	59,716.80	61,505.60	63,356.80	64,313.60	65,270.40	66,248.00	67,246.40	68,244.80	69,264.00	70,304.00	71,364.80	**$72,092.80**				
Sr. Plant Operations Tech	17	$22.73	$27.27	$31.82	22.73	23.41	24.11	24.83	25.57	26.34	27.13	27.94	28.36	28.79	29.22	29.66	30.10	30.55	31.01	31.48	**$31.82**				
Wastewater Plant Op. Supervisor		$47,278.40	$56,721.60	$66,185.60	47,278.40	48,692.80	50,148.80	51,646.40	53,185.60	54,787.20	56,430.40	58,115.20	58,988.80	59,883.20	60,777.60	61,692.80	62,608.00	63,544.00	64,500.80	65,478.40	**$66,185.60**				
Sewer Plant Maint. Mechanic	18	$21.03	$25.24	$29.45	21.03	21.66	22.31	22.98	23.67	24.38	25.11	25.86	26.25	26.64	27.04	27.45	27.86	28.28	28.70	29.13	**$29.45**				
Wastewater Lab Technician		$43,742.40	$52,499.20	$61,256.00	43,742.40	45,052.80	46,404.80	47,798.40	49,233.60	50,710.40	52,228.80	53,788.80	54,600.00	55,411.20	56,243.20	57,096.00	57,948.80	58,822.40	59,696.00	60,590.40	**$61,256.00**				
Water Plant Operations Technician																									
Water Plant Operator																									
Sr. Water Distr. Maintainer																									
Water Distr./Relief Operator																									
Sewer Maintainer	19	$19.68	$23.62	$27.55	19.68	20.27	20.88	21.51	22.16	22.82	23.50	24.21	24.57	24.94	25.31	25.69	26.08	26.47	26.87	27.27	**$27.55**				
Water Distribution Maintainer		$40,934.40	$49,129.60	$57,304.00	40,934.40	42,161.60	43,430.40	44,740.80	46,092.80	47,465.60	48,880.00	50,356.80	51,105.60	51,875.20	52,644.80	53,435.20	54,246.40	55,057.60	55,889.60	56,721.60	**$57,304.00**				
	20	$18.33	$21.99	$25.66	18.33	18.88	19.45	20.03	20.63	21.25	21.89	22.55	22.89	23.23	23.58	23.93	24.29	24.65	25.02	25.40	**$25.66**				
		$38,126.40	$45,739.20	$53,372.80	38,126.40	39,270.40	40,456.00	41,662.40	42,910.40	44,200.00	45,531.20	46,904.00	47,611.20	48,318.40	49,046.40	49,774.40	50,523.20	51,272.00	52,041.60	52,832.00	**$53,372.80**				
	21	$16.97	$20.37	$23.76	16.97	17.48	18.00	18.54	19.10	19.67	20.26	20.87	21.18	21.50	21.82	22.15	22.48	22.82	23.16	23.51	**$23.76**				
		$35,297.60	$42,369.60	$49,420.80	35,297.60	36,358.40	37,440.00	38,563.20	39,728.00	40,913.60	42,140.80	43,409.60	44,054.40	44,720.00	45,385.60	46,072.00	46,758.40	47,465.60	48,172.80	48,900.80	**$49,420.80**				
	22	$15.62	$18.74	$21.86	15.62	16.09	16.57	17.07	17.58	18.11	18.65	19.21	19.5	19.79	20.09	20.39	20.70	21.01	21.33	21.65	**$21.86**				
		$32,489.60	$38,979.20	$45,468.80	32489.60	33,467.20	34,465.60	35 505.60	36,566.40	37,668.80	38,792.00	39956;80	40,560.00	41,163.20	41,787.20	42,411.20	43,056.00	43,700.80	44,366.40	45,032.00	**$45468.80**				
	23	$14.27	$17.12	$19.97	14.27	14.70	15.14	15.59	16.06	16.54	17.04	17.55	17.81	18.08	18.35	18.63	18.91	19.19	19.48	19.77	**$19.97**				
		$29,681.60	$35,609.60	$41,537.60	29,681.60	30,576.00	31,491.20	32,427.20	33,404.80	34,403.20	35,443.20	36,504.00	37,044.80	37,606.40	38,168.00	38,750.40	39,332.80	39,915.20	40,518.40	41,121.60	**$41,537.60**				

Department of Public Works

Eric Lindman, P.E.
Director of Public Works and Utilities

TO: Wausau Waterworks Commission

FROM: Eric Lindman, P.E.
Director of Public Works & Utilities

DATE: August 3, 2021

SUBJECT: Biosolids PFAS Sampling

The Wastewater Facility Upgrade will allow for the production of Class A biosolids versus the current process produces Class B biosolids. Class B is regulated by the WDNR, meaning they have to approve of the method and location of disposal. Class A is not regulated and can be used and disposed of without WDNR oversight.

Currently the Class B biosolids is spread on farm fields as approved by the WDNR. The utility has not tested biosolids for PFAS as these compounds are not regulated as it relates to wastewater. There is no required sampling method or testing method related to PFAS in wastewater. There is a drinking water standard for PFAS of 70ppt; the WDNR has proposed to reduce this level to 20ppt but this is not been implemented and there is no timeframe when this might be pursued. The USEPA is continuing their health impact study related to PFAS compounds but they have not completed this study.

Michigan has done their PFAS wastewater sampling and has developed guidelines for both sampling and recommended test methods. The WDNR recommends these guidelines if utilities pursue testing of wastewater and biosolids. The Michigan Sampling Guidance is attached.

The WDNR has provided guidance to utilities related to PFAS test results in biosolids. The guidance is attached. Again this is only guidance as there are no regulations related to PFAS in biosolids and there is no requirement on sampling or how to sample.

Staff would like input from the Commission and potentially a determination if sampling biosolids should begin.

GENERAL PFAS SAMPLING GUIDANCE

This document contains an introduction to PFAS, biosecurity recommendations, and general recommendations to decrease the possibility of cross-contamination.

Michigan Department of Environmental Quality

Revised 10/16/2018

GENERAL PFAS SAMPLING

Guidance

CONTENTS

Acronyms

Acronyms used throughout the **General PFAS Sampling Guidance** document and/or each sampling guidance are as follows:

AFFF – Aqueous film forming foam
CAS Number – Chemical abstracts service number
COC – Chain of Custody
DEPA – Danish Environmental Protection Agency (Denmark)
EINECS – European List of Notified Chemical Substances (European Union)
ENCS – Existing and New Chemical Substances Inventory (Japan)
ETFE – Ethylene-tetrafluoroethylene
FCMP – Fish Contaminant monitoring program
FCSV – Fish consumption screening values
FDA – Food and Drug Administration (United States of America)
FEP – Fluorinated ethylene propylene
HASP – Health and Safety Plan
HDPE – High-density polyethylene
IECSC – Inventory of Existing Chemical Substances Produced or Imported in China
ITRC – Interstate Technology & Regulatory Council
KECI – Korea Existing Chemicals Inventory (South Korea)
KEMI – Swedish Chemical Agency (Sweden)
LDPE – Low-density polyethylene
LHA – Lifetime Health Advisory (United States Environmental Protection Agency)
MDEQ – Michigan Department of Environmental Quality
MDHHS – Michigan Department of Health and Human Services
MPART – Michigan PFAS Action Response Team
MSDS – Material Safety Data Sheet (former reference)
ng/L – Nanograms per liter
NZIoC – New Zealand Inventory of Chemicals (New Zealand)
PCPs – Personal care products
PID – Photoionization detector
PFAA – Perfluoroalkyl acids
PFAS – Per- and Polyfluoroalkyl Substances
PFC – Polyfluorocarbons
PFCA – Perfluoroalkyl carboxylic acids
PFOA – Perfluorooctanoic acid
PFOS – Perfluorooctanesulfonic acid
PFPE – Perfluoropolyethers
PFSA – Perfluoroalkyl sulfonic acids
PICCS – Philippine Inventory of Chemicals and Chemical Substances (Philippines)
ppb – Parts per billion
PPE – Personal protection equipment
ppt – Parts per trillion
PTFE – Polytetrafluoroethylene
PVC – Polyvinyl chloride
PVDF – Polyvinylidene fluoride
PVF – Polyvinyl fluoride
QA/QC – Quality assurance/quality control
QAPP – Quality Assurance Project Plan
OECD – Organization for Economic Cooperation and Development
SDS – Safety Data Sheet
SWAS – Surface Water Assessment Section (MDEQ)
TSCA – Toxic Substances Control Act (United States of America)
USEPA – United States Environmental Protection Agency
UV – Ultraviolet
VOC – Volatile organic compounds
WRD – Water resources division (MDEQ)

Disclaimer

The Michigan Department of Environmental Quality (MDEQ) intends to update the information contained within this PFAS Sampling Guidance document as new information becomes available. The user of this PFAS Sampling Guidance is encouraged to visit the Michigan PFAS Action Response Team webpage (www.michigan.gov/PFASresponse) to access the current version of this document.

1. Introduction

Per- and polyfluoroalkyl Substances (PFAS) are a class of **emerging contaminants** composed of more than 3,000 human-made, fluorinated, organic chemicals (Buck et al., 2011, Wang et al., 2017). The actual number of compounds is continuously changing, as some PFAS are no longer produced due to regulatory and voluntary actions, while new ones are created as alternatives. The carbon-fluorine bond that exists in PFAS is one of the strongest bonds in nature, they are tough to break and are resistant to thermal, chemical, and biological degradation.

NOTE: Emerging Contaminants are chemicals and materials in the environment and present real or potential human health or environmental risks, and either…

- Do not have peer-reviewed human health standards
  or:
- Standards/regulations are evolving due to new science, new laboratory analytical capabilities, and new knowledge about the chemicals.

Due to their unique chemical properties, various PFAS can lower surface tension (act as surfactants), are oil-repelling (oleophobic), and are water-repelling (hydrophobic), yet are also relatively water soluble. They have been used extensively in many industries worldwide for a wide variety of applications. PFAS were first invented in the late 1930's and commercially used from the 1940's as non-stick coatings. PFAS continued to be used in many industries and various products as more PFAS were developed with unique chemical properties. Some of the documented PFAS uses are in hydraulic fluids, biocides, construction products, fire-fighting foams, household products, wetting and mist suppressing agents, surfactants for oil and natural gas recovery enhancement, polymerization agents, low-friction bearings and seals, insulators, cables, wires, protective coatings for a wide variety of materials, nonstick coatings, surgical patches, cardiovascular grafts, implants, oil and water repellent coatings for a wide range of materials such as paper and cardboard packaging products, carpets, leather products, and textiles (OECD, 2013). The presence of PFAS in these materials is a potential source of environmental concern and cross-contamination.

The probability of false positives is relatively high during PFAS sample collection due to the potential for many sources of cross-contamination, combined with low laboratory detection limits (nanograms per liter (ng/L) or parts per trillion (ppt)). There are many products that could be found in the sampling environment, that have not been documented to either contain or not contain PFAS, and may come into contact with the samples, introducing causing cross-contamination.

The United States Environmental Protection Agency (USEPA) has established a Lifetime Health Advisory (LHA) for Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), separately or combined, of 70 ppt. The MDEQ cleanup criteria protective of groundwater used for drinking water purposes is also 70 ppt for PFOS and PFOA, individually or combined. The MDEQ has also promulgated a standard under Rule 57 for PFOS of 11 ppt for surface water that is used as a drinking water source and 12 ppt for surface water that is not used as a drinking water source.

2. Purpose and Objectives

The purpose of this document is to provide guidance and information to staff who will:

- Collect or handle PFAS environmental samples.
- Perform subsurface activities such as soil borings and/or well installation or well abandonment at PFAS sites.

This document is intended to supplement the MDEQ media-specific PFAS sampling guidance documents and is a resource for PFAS sampling.

The objectives of this document are as follows:

- Provide guidance on avoiding PFAS cross-contamination during sampling.
- Improve sampling consistency and data quality.
- Provide guidance to MDEQ staff and contractors.

Because PFAS are emerging contaminants and information about their use in various materials is still not available; the MDEQ will update this document as new information becomes available.

NOTE: This guidance does not include specific information for sampling environmental media and should not be used to replace specific sampling guidance documents required for use by MDEQ staff.

3. Farm Biosecurity

In the event PFAS sampling occurs on or near a farm, staff need to follow the requirements in this document when conducting sample collection, to reduce the likelihood of transporting animal diseases.

3.1 Scheduling

To avoid cross-contamination from previous sampling locations, it is preferable that staff visit only one farm in a day.

3.2 Before Sampling

Staff should review **Section 4.2.4. Field Clothing and Personal Protective Equipment (PPE)** before going into the field.

Staff must have a clean vehicle, clean clothing, and clean boots to visit the sampling location. Before arriving at the farm, staff should call the owner of the farm to indicate they will be arriving shortly and ask if there are any additional biosecurity requirements for their farm. Once at the farm, staff should park away from any animals and barns; preferably in a designated visitor area or on concrete.

Immediately before exiting the vehicle, place disposable PFAS-free boot covers over boots. (*NOTE: Disposable boot covers can be slippery, especially in icy/snowy conditions.*)

3.3 While Sampling

Staff should not approach animal areas unless necessary for testing. If access to an animal area is needed, staff should always be accompanied by farm personnel.

3.4 After Sampling

Dispose of used disposable boot covers at the facility if possible; otherwise, place in a plastic bag, seal and place in the vehicle trunk to dispose of properly later.

4. General PFAS Sampling

The following sections discuss technical issues such as the need to use PFAS-free water; information about PFAS-free clothing and PPE; and laboratory issues that should be considered when sampling for PFAS.

4.1 Sampling Objectives

Before conducting any PFAS sampling, it is recommended that a project-specific Quality Assurance Project Plan (QAPP) should be developed. The QAPP must meet MDEQ policy and should include the analyte list, method of analysis, environmental matrices, and reporting limits, which are based on the project objectives. All of these considerations will be discussed in more detail in this guidance document.

4.2 PFAS Cross-Contamination Potential Sources

Potential sources of PFAS cross-contamination in the typical sampling environment include water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment (PPE), sun and biological protection products, personal hygiene and personal care products (PCPs), food packaging, and the environment itself.

The materials associated with sampling that have the potential for PFAS cross-contamination have been divided into three major groups:

- Prohibited (●) identifies items and materials that should not be used when sampling. It is well documented that they contain PFAS or that PFAS are used in their manufacture.

- Allowable (■) identifies items and materials that have been proven not to be sources of PFAS cross contamination and are considered allowable for sampling.

- Needs Screening (▲) identifies items and materials that have the potential for PFAS cross-contamination due to a lack of scientific data or statements from manufacturers to prove otherwise. These items and materials are further sub-divided into two categories:

    - **Category 1:** Items and materials that <u>will come in direct contact</u> with the sample. These should not be used when sampling unless they are known to be PFAS-free, by collecting an equipment blank sample prior to use.

    - **Category 2:** Items and materials that <u>will not come in direct contact</u> with the sample. These should be avoided, if possible, unless they are known to be PFAS-free by collecting an equipment blank sample prior to use.

All of the materials or items discussed in each of the MDEQ's PFAS Sampling Guidance Documents will be divided into ● Prohibited ■ Allowable, or ▲ Needs Screening. Several examples of prohibited and allowable materials and materials that need screening are listed in the **MDEQ PFAS Sampling Quick Reference Field Guide** at the end of this document. Also, materials and items that are specific to a particular environmental media or sampling method will be thoroughly explained in that media's sampling guidance document (such as peristaltic pumps for groundwater sampling).

NOTE: If recommended PPE will be used during sampling, **Category 2** materials are not expected to be a source of cross-contamination as long as they do not come into contact with the samples.

●- Prohibited ■- Allowable ▲- Needs Screening

Please note that at this time no published research is available that documents the use of various materials and their effect on sample results. Therefore, a conservative approach is recommended in this guidance based on the evaluation of multiple environmental samples at various PFAS sites. Field sampling occurring during extreme weather (e.g., rainfall, snowfall, or extreme heat) should be conducted while wearing the appropriate clothing that will not pose a risk for cross-contamination but will also ensure the safety of the field personnel.

4.2.1 PFAS-Free Water

The term PFAS-free water is defined here as water that does not contain significant concentrations of any compound in a specific PFAS analyte list that is being analyzed at a project-defined level. The significant concentrations depend on project data quality objectives and could, for instance, be less than the laboratory reporting limit, <1/2 the limit of quantitation, or other defined criteria for the specific PFAS compound of interest (ITRC, 2017).

NOTE: The confirmation of PFAS-free water should always be performed prior to the commencement of work. Site or public water supplies have been identified in many instances to contain detectable levels of PFAS.

One important consideration for each project is to identify a PFAS-free water source to use for decontamination of sampling and drilling equipment when applicable. The decontamination of sampling tools or small equipment parts can be performed using laboratory-supplied verified PFAS-free water. Other water can only be used for decontamination purposes if it has been analyzed and shown to be PFAS-free as defined for the project.

4.2.2 Materials Screening

Materials screening should be performed during the Health and Safety Plan (HASP) and QAPP development or the planning phase of sampling programs. The screening should be performed on all of the items and materials that are expected to come into contact with the samples and defined as **Category 1**.

Material screening should include a review of Safety Data Sheets (SDSs; formerly Material SDS [MSDSs]). Make sure the review uses current SDSs, because the actual composition of a particular item or material may have changed over time without changing the actual item or material name. All products from the United States or abroad should be screened. Text fragments such as “perfluoro,” “fluoro,” or “fluorosurfactant” may identify the use of PFAS in specific items or materials.

NOTE: Manufacturers can change the chemical composition of any product. As a result, equipment blank samples should be collected for all materials that will come into direct contact with the sample media, regardless of what category they might be in, to confirm they are “PFAS-free”, i.e. will not contaminate samples at detectable levels. **There is no guarantee that materials in the ‘Allowable category will always be PFAS-free.**

Some countries have official national lists of industrial chemicals defined by regulations, such as:

- Toxic Substances Control Act (TSCA) in the United States.
- European List of Notified Chemical Substances (EINECS), as well as substances pre-registered under the Registration, Evaluation, Authorization, and restriction of Chemicals (REACH) in the European Union.
- Swedish Chemical Agency (KEMI) in Sweden.

● - Prohibited ■ - Allowable ▲ - Needs Screening

- Domestic Substances List (DSL) in Canada.
- Inventory of Existing New Chemical Substances Produced or Imported in China (IECSC)
- Existing and New Chemical Substances Inventory (ENCS) in Japan.
- Korea Existing Chemicals Inventory (KECI) in South Korea.
- New Zealand Inventory of Chemicals (NZIoC) in New Zealand.
- Philippine Inventory of Chemicals and Chemical Substances (PICCS) in the Philippines.

The information available on these lists includes the chemical names and various identity numbers, which is usually the Chemical Abstracts Service number (CAS Number) (KEMI, 2015). The lists may not contain a substantial amount of information because of laws in regards to proprietary information, which gives the suppliers the right to not name newly developed chemicals. The information is not always sufficient to identify if the items or materials contain PFAS, as many of the PFAS do not have an assigned CAS Number at this time (KEMI, 2015). The most recent summary conducted by the Organization for Economic Co-operation and Development (OECD) identified 4,730 PFAS-related CAS numbers (OECD, 2018).

Sometimes manufacturers provide information about their products online or upon request, which may indicate if PFAS were used in the manufacturing of a particular item or material.

4.2.3 Sampling Equipment

The actual list of PFAS-containing materials potentially encountered onsite will change based on the specific sampled media and site-specific sampling conditions. Do not use any equipment that contains any known fluoropolymers. Consider all of the following:

- Do not use polytetrafluoroethylene (PTFE) that includes the trademark Teflon® and Hostaflon®, which can be found in many items, including but not limited to the lining of some hoses and tubing, some wiring, certain kinds of gears, and some objects that require the sliding action of parts.
- Do not use Polyvinylidene fluoride (PVDF) that includes the trademark Kynar®, which can be found in many items, including but not limited to tubing, films/coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries.
- Do not use Polychlorotrifluoroethylene (PCTFE) that includes the trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.
- Do not use Ethylene-tetrafluoroethylene (ETFE) that includes the trademark Tefzel®, which can be found in many items, including but not limited to the wire and cable insulation and covers, films for roofing and siding, liners in pipes, and some cable tie wraps.
- Do not use Fluorinated ethylene propylene (FEP) that includes the trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, which can be found in many items, including but not limited to the wire and cable insulation and covers, pipe linings, and some labware.
- Do not use low-density polyethylene (LDPE) for any items that will come into direct contact with the sample media. LDPE can be found in many items, including but not limited to containers and bottles, plastic bags, and tubing.
    - ▲ **However**, LDPE may be used if an equipment blank has confirmed it to be PFAS-free. LDPE does not contain PFAS in the raw material but may contain PFAS cross-contamination from the manufacturing process.

●- Prohibited ■- Allowable ▲- Needs Screening

- ■ LDPE bags (e.g., Ziploc®) that do not come into direct contact with the sample media and do not introduce cross-contamination with samples may be used.
- ■ Use materials that are either made of high-density polyethylene (HDPE), polypropylene, silicone, or acetate.
- ■ Glass bottles or containers may be used if they are known to be PFAS-free, however, PFAS have been found to adsorb to glass, especially when the sample is in contact with the glass for a long period of time (e.g. being stored in a glass container). If the sample comes into direct contact with the glass for a short period of time (e.g. using a glass container to collect the sample, then transferring the sample to a non-glass sample bottle), the adsorption is minimal.
- ■ Powderless nitrile gloves (which can be found at some hardware and major retail outlets).
- ▲ Latex gloves should be screened before use.
- ▲ Some sampling guidance documents allow the use of aluminum foil provided the shiny side is placed away from the sample (e.g., fish tissue sampling guidance). As a precaution, MDEQ recommends that aluminum foil not is used unless equipment blank samples confirm it is PFAS-free.

4.2.4 Field Clothing and Personal Protective Equipment (PPE)

Any field planning and mobilization effort should address the physical, chemical, and biological hazards associated with each PFAS site. The mitigation of potential risks may be documented in a site-specific HASP or a QAPP. Due to the extensive use of PFAS in many industries and products, PPE may contain PFAS. During PFAS investigation, PPE containing PFAS should be avoided to prevent cross-contamination. The development of the HASP or QAPP should consider these factors before mobilization in the field. All HASPs or QAPPs need to address the concern of potential exposure of staff to PFAS through PPE.

Personal safety is paramount. The safety of staff should not be compromised by fear of PFAS containing materials without any scientific basis. Any deviation from this guidance, including those necessary to ensure the health and safety of sampling personnel, must be recorded in field notes and discussed in the final report.

Globally, protective coatings for textiles are estimated to be about 50 percent of the total use of PFAS (DEPA, 2015). Due to its unique properties of water and oil repellency, PFAS has been used to coat various clothing (i.e., pants, jackets, and t-shirts) and leather products (i.e., boots, shoes, and jackets). Many of these types of clothing and PPE have the potential to be used in the sampling environment.

NOTE: The Danish Ministry of the Environment identified alternative polymer technology as being PFAS-free. Products treated with this technology are water- resistant, but not oil and dirt repellent to the same extent as products treated with PFAS- based agents (DEPA, 2015).

While preparing for sampling, particular focus should be made on clothing that has been advertised as having waterproof, water-repellant, or dirt and/or stain resistant characteristics. These types of clothing are most likely to have had PFAS used in their manufacturing.

Field Clothing and PPE that should be avoided (●) in the immediate sampling environment include the following:

- ● Do not use clothing that has been washed with fabric softener which may contain PFAS.
- ● Do not use clothing that has been made with or washed with water, dirt, and/or stain resistant chemicals.
- ● Do not use clothing chemically treated for insect resistance and ultraviolet protection (See **Section 4.2.5** on biological hazards).
- ● Do not use clothing or PPE items that have any of the brand or product names that have been found to contain PFAS by the Danish Ministry of the Environment and presented in **Table 1** below (DEPA, 2015).

Field Clothing and PPE that are allowable (■) to wear within the immediate sampling environment include the following:

- ■ Powderless nitrile gloves.
- ■ Polyvinyl chloride (PVC) or wax-coated fabrics.
- ■ Neoprene.
- ■ Any boots made of polyurethane and/or PVC. If the HASP requires a specific type of boot such as (steel-toed), and PFAS-free cannot be purchased, PFAS- free over-boots may be worn. The overboots must be put on, and hands washed after putting the overboots on before the beginning of sampling activities. Overboots may only be removed in the staging area and after the sampling activities have been completed.
- ■ Synthetic and natural fibers (preferably cotton) that are well laundered (more than six times with no fabric softener) clothes and cotton overalls.

NOTE: There could be many PPE materials used during various sampling events, including hard hats and safety glasses. All clothing and PPE should be evaluated prior to sampling.

Field Clothing and PPE that must be evaluated (▲) before wearing within the immediate sampling environment include the following:

- ▲ Latex gloves.
- ▲ Water resistant or stain-treated clothing and PPE.
- ▲ Tyvek suits and clothing that contain Tyvek® (USEPA PFAS sampling guidance from USEPA Region 2 prohibits the use of Tyvek; available product information suggests Tyvek® may be used if required. Coated Tyvek® requires further evaluation; therefore, MDEQ recommends the collection of an Equipment Blank before Tyvek® use).

Table 1 below provides a list of prohibited field clothing (DEPA, 2015). However, the manufacturer and/or vendor for the field clothing and/or PPE should be contacted to confirm that these brand or product names still contain PFAS. There have been instances where manufacturers have kept the same brand and/or product name but have changed the chemicals used during the manufacturing of a particular item.

Table 1. Prohibited Field Clothing and PPE Brand and Product Names

● Prohibited Materials[1] (DEPA, 2015)	
Advanced Dual Action Teflon® fabric protector.	Release Teflon®
Repel Teflon® fabric protector	High-Performance Release Teflon®
High performance Repel Teflon® fabric protector	Ultra Release Teflon®
NK Guard S series	GreenShield®
Tri-Effects Teflon® fabric protector	Lurotex Protector RL ECO®
Oleophobol CP®	Repellan KFC®
Rucostar® EEE6	UnidyneTM
Bionic Finish®	RUCO-GUARD®
RUCOSTAR®	RUCO-COAT®
RUCO-PROTECT®	RUCOTEC®
RUCO®	Resist Spills™
Resists Spills and Releases Stains™	Scotchgard™ Fabric Protector

[1]This list is not considered to be a complete listing of prohibited materials. All materials should be evaluated before use during sampling.

4.2.5 Sun and Biological Protection

Because biological hazards (sunburn, mosquitos, ticks, etc.) may be encountered during sampling, the elimination of specific clothing materials or PPE (sunscreens and insect repellants) could pose a health and safety hazard to staff.

The safety of staff should not be compromised by fear of PFAS containing materials without any scientific basis. Personal safety is paramount. Any deviation from this guidance, including those necessary to ensure the health and safety of MDEQ staff, should be recorded in field notes and discussed in the final report.

Prolonged sun exposure will require sunscreens, which may have included PFAS in their manufacture. Protection against insects may require the use of insect repellant. **Table 2** contains a detailed list of sunscreens and insect repellants that have been analyzed and found to be PFAS-free as of the date of this document. Note that this is not a comprehensive list of allowable insect repellants or sunscreens; other products may meet the requirements for use. Listing or omission of any product does not imply endorsement or disapproval. Also, there is no guarantee that these products will always remain PFAS free.

NOTE: Sunscreens and insect repellants must be evaluated on a case-by-case basis. Refer to **Section 4.6 Quality Control Samples** for details on collecting equipment blanks.

The MDEQ recommends that additional sunscreens and insect repellents be treated as (▲) Needs Screening and should be evaluated before use.

- ● Sunscreens and insect repellants should not be applied near the sample collection area.
- ■ Hands should be well washed after application or handling of these products, and afterwards, powderless nitrile gloves should be worn.

●- Prohibited ■- Allowable ▲- Needs Screening

Table 2. Sunscreen and Insect Repellents[1]

■ Allowable Insect Repellants	
Photos	**Insect Repellent Spray**
	• OFF Deep Woods • Sawyer Permethrin

■ Allowable Sunscreens	
Photos	**Sunscreens**
	• Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30. • Meijer Sunscreen Lotion Broad Spectrum SPF 30. • Neutrogena Ultra-Sheer Dry-Touch Sunscreen Broad Spectrum SPF 30.

■ Allowable Sunscreens
• Banana Boat for Men Triple Defense Continuous Spray Sunscreen SPF 30
• Banana Boat Sport Performance Coolzone Broad Spectrum SPF 30
• Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30
• Banana Boat Sport Performance Sunscreen Stick SPF 50
• Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50
• Coppertone Sport High-Performance AccuSpray Sunscreen SPF 30
• Coppertone Sunscreen Stick Kids SPF 55
• L'Oréal Silky Sheer Face Lotion 50+
• Meijer Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50
• Meijer Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70
• Neutrogena Beach Defense Water + Sun Barrier Lotion SPF 70
• Neutrogena Beach Defense Water + Sun Barrier Spray Broad Spectrum SPF 30
• Neutrogena Pure & Free Baby Sunscreen Broad Spectrum SPF 60+
▲ Materials That Require Screening
Sunscreens: Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss My Face, and baby sunscreens that are "free" or "natural."
Insect Repellents: Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, Baby Ganics.
Sunscreen and Insect Repellent: Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion.

[1]This table is not considered to be a complete listing of allowable materials and materials that require screening. All materials should be evaluated before use during sampling. Some of the sunscreen and insect repellent testing has been performed using a PFAS screening Method known as Particle Induce Gamma-Ray Emission (PIGE). The use of approved gloves should always be used, and the sample should never come into contact with any of the sunscreen or insect repellent products. An Equipment Blank sample could also be collected to verify the product as PFAS-free.

●- Prohibited ■- Allowable ▲- Needs Screening

If an insect repellant has not been approved and staff needs protection against biting insects:

NOTE: The words "Natural" and/or "Organic" in the product name or to describe it does not mean that it is PFAS-free.

- Tuck pant legs into socks and/or boots to seal the gap between the boots and the pants to reduce the risk of being bitten by ticks.
- Wear well-washed, light-colored clothing to easily see ticks during field activities.
- Light-colored clothing, long sleeves, and large-brimmed hats also prevent sunburn.
- Equipment Blank samples should be collected to verify that the preferred insect repellant or sunscreen is PFAS-free by using the testing procedures identified in **Section 4.6 Quality Control Samples**.

4.2.6 Personnel Hygiene and Personal Care Products (PCPs)

A number of sampling guidance documents recommend that personal hygiene and personal care products (PCPs) (e.g., cosmetics, shampoo, sunscreens, dental floss, etc.) not be used prior to and on the day(s) of sampling because the presence of PFAS in these products has been documented (OECD, 2002, Fujii, 2013, Borg and Ivarsson, 2017). However, if the MDEQ's sampling SOPs are followed, these items should not come into contact with the sampling equipment or the sample being collected. As of the date of this sampling guidance, cross-contamination of samples due to the use of PCPs has not been documented during the collection of thousands of samples. However, field personnel should be aware of the potential of cross-contamination if the sampling equipment or actual samples would come into contact with these products. The following precautions should be taken when dealing with personal hygiene or PCPs before sampling:

- ● Do not handle or apply PCPs in the sampling area.
- ● Do not handle or apply PCPs while wearing PPE that will be present during sampling.
- ■ Move to the staging area and remove PPE if applying personal care products becomes necessary.
- ■ Wash hands thoroughly after the handling or application of PCPs and, when finished, put on a fresh pair of powderless nitrile gloves.

4.2.7 Food Packaging

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps (OECD, 2002). In January 2016, the Food and Drug Administration (FDA) banned the use of PFAS which has eight carbon atoms (such as PFOA and PFOS) or more, in food packaging materials. However, PFOA and PFOS or other eight or more carbon chain PFAS may still be detected in food packaging because of the use of recycled paper which may contain PFAS. Various studies have found up to 57percent detection frequency in food contact materials such as paper (Trier et al., 2011; Rosenmai et al., 2013; Schaider et al., 2017).

NOTE: Short-chain PFAS have not been banned for use in the manufacturing of contact food materials in the United States.

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps (OECD, 2002). Pre-wrapped food or snacks (such as candy bars, microwave popcorn, etc.) must not be in the sampling and staging areas during sampling due to PFAS contamination of the packaging. When staff

requires a break to eat or drink, they should remove their gloves, coveralls, and any other PPE, if worn, in the staging area and move to the designated area for food and beverage consumption. When finished, staff should wash their hands and put on a fresh pair of powderless nitrile gloves at the staging area, before returning to the sampling area.

- ● Do not handle, consume, or otherwise interact with pre-wrapped food or snacks, carry-out food, fast food, or other food items while on-site during sampling.
- ■ Move to the staging area and remove PPE prior to leaving the sampling and staging areas if consuming food on site becomes necessary.

4.3 PFAS Sampling Procedures

4.3.1 Sample Containers, Handling, and Collection

All bottles used for PFAS sampling should come from the laboratory that will also be performing the PFAS analysis. Commercial laboratories that have demonstrated awareness and elimination of possible PFAS cross-contamination from sample containers and laboratory supplies should be used. Recommended sampling containers will be discussed for each environmental media. Any sampling containers provided by the laboratory should be verified as PFAS-free.

Before sampling, staff may come into contact with textiles and fabrics treated with PFAS, such as carpets and car interiors. Staff should be aware that these materials, and any other surfaces that repel water and are stain resistant, have the potential of being treated with PFAS. However, these are considered **Category 2** materials and the field personnel should be aware of the possible PFAS use. Sample containers and equipment that will be used for sampling should not be stored on or come into contact with materials suspected to contain PFAS.

For all environmental media, hands should be well washed before sampling. Clean powderless nitrile gloves must be put on before sample collection, handling of sample containers, and handling sampling equipment. The sample container must be kept sealed at all times and only open during the sample collection. The sampling container cap or lid should never be placed on any surface unless it is PFAS-free. The sampling container cap or lid must never be placed directly on the ground. A list of various materials used in sampling and handling can be found in the **MDEQ Quick Reference Field Guide** located at the end of this document.

In the absence of formal USEPA guidance for PFAS sample storage, the documentation in EPA Method 537 Rev. 1.1 should be used as a guide for thermal preservation (holding temperature), and holding times for other environmental media samples (with the exception of biota – in order to limit microbial growth, biota samples such as fish and vegetation are recommended to be kept frozen until the sample is prepared).

If published analytical reference methods, other than EPA Method 537 Rev. 1.1 are used, follow the guidelines or requirements in those methods for sample storage, preservation, and hold times. Otherwise EPA Method 537 Rev. 1.1 requries that samples must be chilled during storage and shipment, and must not exceed 50°F (10°C) during the first 48 hours after collection.

4.3.2 Sample Shipment

In general, for all environmental media sampled for PFAS, samples must be kept on ice from the time of sample collection to the arrival at the laboratory. The following procedures should be used for sample shipment:

● - Prohibited ■ - Allowable ▲ - Needs Screening

- Regular ice should be used to cool and maintain the sample at or below the proper temperature.
  - ▲ Chemical or blue ice may be used if it is known to be PFAS-free and it is absolutely certain that the sample is cooled and maintained at or below the proper temperature during collection and through transit to the laboratory.
- Refresh with regular ice, if needed, double bagged in LDPE resealable storage bags if needed.
- Fish and other wildlife samples should be placed on dry ice and frozen before the shipment to the lab. If fish is frozen, shipping the samples overnight on ice should be acceptable.
- The samples, ice, and chain of custody (COC) should always be bagged in polyethylene (i.e., Ziploc®) bags.
- Chain of Custody and other forms should be single bagged in LDPE resealable storage bags and taped to the inside of the cooler lid.
- The cooler should be taped closed with a custody seal and shipped by overnight courier.
- Samples should be shipped as soon as possible (e.g. overnight) to ensure the samples arrive within the analytical holding time specified by the lab.

4.3.3 Preferential Sampling Sequence

A preferred sampling sequence should be established before any sampling event to reduce the risk of cross-contamination. In general, the sampling sequence should be such that sampling starts in areas where it is expected or known to be least contaminated, to areas anticipated or identified to be most contaminated. If analytical results from past sampling events are available, the sampling sequence can be readily determined.

For many PFAS investigation sites, no PFAS sampling has been conducted. In these cases, all site information on possible PFAS uses and potential PFAS migration patterns (e.g., upgradient, downgradient) from PFAS sources at the site should be reviewed before the sampling event to help establish the sampling sequence.

If multiple samples (i.e., monitoring wells) will be collected for an area where a particular or potential PFAS release in the environment might have been documented, samples that are known to be upgradient from the impacted area should be sampled first, followed by those that are furthest downgradient from the suspected source. The remaining wells should be progressively sampled from the most distant downgradient to those closer to the known PFAS source.

If no information is available about the site, samples are to be collected in the following order:

1) drinking water (e.g., residential wells).
2) surface water.
3) groundwater.

4.4 Decontamination Procedures

It is customary with sampling that equipment is decontaminated at the conclusion of the sampling event. If the previous user of the equipment is not known, and it is unclear how the equipment was handled, especially rental equipment, the equipment should be decontaminated.

Disposable **Category 1** sampling equipment should be used, especially for sample bottles and other materials that are used where the sample may be in contact with the sampling equipment for an extended time period.

Non-disposable sampling equipment used at multiple sites or sampling locations can become highly contaminated with PFAS. Decontamination procedures must be implemented to prevent cross-contamination, especially between individual sample locations. It is customary to decontaminate sampling equipment at the end of the sampling event, whether the event is a single sampling location or several sites that conclude at the end of the workday.

Throughout the sampling guidance documents, information will be provided about any media-specific decontamination procedures. For non-dedicated **Category 1** sampling equipment, there are many decontamination methods, two of which are listed below.

Decontamination Method 1:

- ● Do not use Decon 90®.
- ● Do not put equipment away without decontaminating it.
- ■ Laboratory supplied PFAS-free deionized water is preferred for decontamination.
- ■ Alconox®, Liquinox®, and Citranox® can be used for equipment decontamination.
- ■ Sampling equipment can be scrubbed using polyethylene or polyvinylchloride (PVC) brush to remove particulates.
- ■ Decontamination procedures should include triple rinsing with PFAS-free water.
- ■ Do decontaminate sampling equipment after sampling at each location, or at the end of the workday.
- ■ Commercially available deionized water in an HDPE container may be used for decontamination if the water is verified to be PFAS-free as defined in **Section 4.2.1** of this document.
- ▲ Municipal drinking water may be used for decontamination purposes if it is known to be PFAS-free.

Decontamination Method 2:

1. In a PFAS-free bucket, wash the equipment with a mixture of PFAS-free water and PFAS-free soap (bucket #1)
2. In a second PFAS-free bucket (bucket #2), rinse the equipment with PFAS-free water
3. A second rinse should be done with PFAS-free water using either a third bucket (bucket #3) or, if washed and rinsed, the second bucket (bucket #2).
4. For decontamination of additional equipment, change the decontamination water between cleanings.

4.5 Laboratory Considerations

The PFAS analytical list is available on the MPART website (www.michigan.gov/PFASresponse) under Testing and Treatment. This list includes the 14 analytes required to be analyzed for drinking water samples when using USEPA Method 537 Rev. 1.1, and the 24 analytes the MDEQ recommends be analyzed for all other environmental media. The MPART website should be visited to download the most recent document. Laboratories should be able to analyze and report PFAS results that will meet the project-specific data quality objectives identified in the QAPP.

Drinking Water Samples

USEPA Method 537 Revision 1.1 must be used for testing finished drinking water samples. Other methods are available for non-drinking water samples. Many laboratories refer to the isotope dilution method as 'modified Method 537,' however, the USEPA does not recognize isotope dilution as an acceptable modification of USEPA Method 537 Rev. 1.1 for drinking water analysis. USEPA drinking water methods are generally prescriptive, and only limited modifications are allowed because the finished treated drinking water is assumed to be free of significant interferences.

NOTE: USEPA Method 537 Rev. 1.1 was developed to be used only for finished drinking water samples, and contains specific requirements for sample preservation, shipping storage, and holding times.

USEPA Method 537 Rev. 1.1 was designed for finished drinking water and chemical preservation using Trizma® to buffer the sample and remove free chlorine. Non-chlorinated finished drinking water may also be analyzed using USEPA Method 537 Rev. 1.1.

Other Environmental Media Samples

There are currently no published USEPA methods using isotope dilution for determining PFAS in non-drinking water matrices or other sample media. There are USEPA methods for analyzing PFAS in additional matrices going through the development and validation process and may be available as early as fall of 2018. Some commercial laboratories have developed isotope dilution methods based on existing published methods, however, there may be significant differences between SOPs from different commercial laboratories regarding the details of the preparation and analysis of PFAS samples. A review of the laboratory's procedure and certifications should be done to ensure that the laboratory is capable of providing data that meet the data quality objectives of the project. MDEQ is implementing a laboratory SOP review process. Staff should refer to the MDEQ internal shared drive to see whether SOPs have been reviewed for the lab they are considering.

The following non-USEPA analytical methods have been published for use in determining PFAS in various media:

- ISO (International Organization for Standardization) Method 25101 (ISO, 2009) - Water quality Determination of PFOA and PFOS - Method for unfiltered samples of drinking water, groundwater, and surface water, using solid phase extraction and liquid chromatography/mass spectrometry (HPLC/MS/MS.)

- ASTM D7979 (ASTM, 2017) - Standard Test Method for Determination of Per- and Polyfluoroalkyl Substances in Water, Sludge, Influent, Effluent and Wastewater by Liquid Chromatography-Tandem Mass Spectrometry (LC/MS/MS). This method has been investigated for use with surface water, sludge, and wastewater for selected PFAS. This method has not been evaluated on drinking water matrices. Some commercial laboratories have modified this method and are using isotope dilution.

- ASTM D7968 (ASTM, 2017) - Standard Test Method for Determination of Polyfluorinated Compounds in Soil by Liquid Chromatography-Tandem Mass Spectrometry (LC/MS/MS). This procedure utilizes a quick extraction and is not intended to generate an exhaustive accounting of the content of PFAS in difficult soil matrices.

4.6 Quality Control Samples

4.6.1 Laboratory Quality Control Samples

The QAPP should describe what batch quality control (QC) samples – such as method blank (MB), laboratory control sample (LCS), laboratory control sample duplicate (LCSD), field duplicate (FD), matrix spike (MS), and matrix spike duplicate (MSD) – are prepared for each media type. In some cases, depending on the project, additional QC samples may be required. For samples with high concentrations of PFAS, an FD may be warranted. The QAPP should also reference the laboratory SOP.

4.6.2 Field Quality Control Samples

Field QC samples can be used to evaluate the field equipment and supplies as well as assess the possibility of cross-contamination during sampling, transport, and storage of samples. For samples such as equipment rinse blanks (EB), field blanks (FB), and trip blanks (TB) the following is required:

- EB should be collected by passing laboratory verified PFAS-free water over or through decontaminated field sampling equipment before the collection of samples to assess the adequacy of the decontamination process and/or to evaluate potential contamination from the equipment used during sampling. The recommended frequency should be in the QAPP.

- FB are prepared in the laboratory by placing an aliquot of PFAS-free water reagent water in a sample container and treating it as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FB is to determine if method analytes or other interferences are present in the field environment. The recommended frequency should be in the QAPP.

- TB are a bottle of PFAS-free water that should be prepared in the laboratory, should then travel from the laboratory to the site, and then get transported back to the laboratory without having been exposed to any sampling procedures. Typically, a TB is used for volatile compounds, but it may be recommended for PFAS sampling to assess cross-contamination introduced from the laboratory and during shipping procedures. The recommended frequency should be in the QAPP

5. References

Agency for Toxic Substances and Disease Registry (ATSDR). “Draft Toxicological Profile for Perfluoroalkyls.” *United States Department of Health and Human Services. (*2015). *ATSDR.* Web. 19 June 2018. https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf

ASTM International. “ASTM D7979 - Standard Test Method for Determination of Per- and Polyfluoroalkyl Substances in Water, Sludge, Influent, Effluent and Wastewater by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS).” ASTM International. Web. 19 June 2018. https://www.astm.org/Standards/D7979.htm

ASTM International. “ASTM D7968 - Standard Test Method for Determination of Polyfluorinated Compounds in Soil by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS).” ASTM International. Web. 19 June 2018. https://www.astm.org/Standards/D7968.htm

Borg, Daniel and Ivarsson, Jenny. “Analysis of PFASs and TOF in Products.” *Nordic Co-Operation* 543 (2017): 1-47. *Nordic Council of Ministers*. Web. 19 June 2018. https://norden.diva-portal.org/smash/get/diva2:1118439/FULLTEXT01.pdf

Buck, Robert C et al. “Perfluoroalkyl and Polyfluoroalkyl Substances in the Environment: Terminology, Classification, and Origins.” *Integrated Environmental Assessment and Management* 7(4) (2011): 513–541. *PMC*. Web. 11 June 2018. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3214619/

Danish Environmental Protection Agency (DEPA). “Polyfluoroalkyl substances (PFASs) in textiles for children.” DEPA 137 (2015). *ResearchGate*. Web. 19 June 2018. https://www.researchgate.net/publication/299228813_Alternatives_to_perfluoroalkyl_and_polyfluoroalkyl_substances_PFAS_in_textiles_LOUS_Survey_of_chemical_substances_in_consumer_products

Fujii, Y. et al. “Occurrence of perfluorinated carboxylic acids (PFCAs) in personal care products and compounding agents.” *Chemosphere* 93(3) (2013):538-544. *NCBI.* Web. 19 June 2018. https://www.ncbi.nlm.nih.gov/pubmed/23932147

Interstate Regulatory Technology Council (ITRC). “Regulations, Guidance, and Advisories for Per- and Polyfluoroalkyl Substances (PFAS).” (2017). *ITRC Web.* Web. 19 June 2018. https://pfas-1.itrcweb.org/wp-content/uploads/2018/01/pfas_fact_sheet_regulations__1_4_18.pdf

International Organization of Standardization (ISO). “ISO 25101:2009 Water quality -- Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) -- Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry.” (2009). *Iso*. Web. 19 June 2018. https://www.iso.org/standard/42742.html

KEMI. “Occurrence and use of highly fluorinated substances and alternatives” *Swedish Chemicals Agency.* (2015). *KEMI*. Web. 19 June 2018. https://www.kemi.se/en/global/rapporter/2015/report-7-15-occurrence-and-use-of-highly-fluorinated-substances-and-alternatives.pdf

Organization for Economic Cooperation and Development (OECD)/UNEP Global PFC Group, “Technical Guidance Document on the Use of Socio-Economic Analysis in Chemical Risk Management Decision Making.” *Risk Management Series* (14) (2002). OECD. Web. 19 June 2018. http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/JM/MONO(2002)10&docLanguage=En

Organization for Economic Cooperation and Development (OECD) (2013), OECD/UNEP Global PFC Group, Synthesis paper on per- and polyfluorinated chemicals (PFCs), Environment, Health and Safety, Environment Directorate, OECD. Web. 19 June 2018. https://www.oecd.org/env/ehs/risk-management/PFC_FINAL-Web.pdf

Rosenmai, A.K. et al. “Fluorochemicals used in food packaging inhibit male sex hormone synthesis.” *Toxicology and Applied Pharmacology* 266(1) (2013): 132-142. *Elsevier*. Web. 19 June 2018. https://www.sciencedirect.com/science/article/pii/S0041008X12004644

Schaider, Laurel A. et al. “Fluorinated Compounds in U.S. Fast Food Packaging.” *Environmental Science and Technology Letters* 4(3) (2017): 105-111. *ACS*. Web. 19 June 2018. https://pubs.acs.org/doi/abs/10.1021/acs.estlett.6b00435

Trier, Xenia et al. “Polyfluorinated surfactants (PFS) in paper and board coatings for food packaging.” *Environmental Science and Pollution Research.* 18(7) (2011): 1108-1120. *SpringerLink*. Web. 19 June 2018. https://link.springer.com/article/10.1007/s11356-010-0439-3

United States Environmental Protection Agency (USEPA). SHOEMAKER, J. A., P. GRIMMETT, AND B. BOUTIN. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). (USEPA Method 537 Revision 1.1) USEPA, Washington, DC, 2008. https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=525468

Wang, Zhanyun et al. “A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?” *Environmental Science & Technology* 51(5) (2017): 2508-2518. *ACES Publications*. Web. 11 June 2018. https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b04806

6. Trademarks

Trademarks used in this document are as follows, and do not constitute an endorsement by the MDEQ:
Alconox® is a registered trademark of Alconox, Inc.
Bionic Finish® is a registered trademark of the Rudolf Group.
Citronex® is a registered trademark of Citronex.
Decon 90® is a trademark of Decon Laboratories Limited.
Gatorade® is a registered trademark of Stokely-Van Camp, Inc.
Gore-Tex® is a registered trademark of W. L. Gore & Associates, Inc.
GreenShield® is a registered trademark of BigSky Technologies LLC.
Hostaflon® FEP is a registered trademark of Hoechst AG.
Hostaflon® is a registered trademark of the Chemours Company (formerly E. I. DuPont de Nemours and Company).
Kynar® is a registered trademark of Arkema, Inc.
Liquinox® is a registered trademark of Alconox, Inc.
Lurotex Protector RL ECO® is a registered trademark of BASF Group.
Neoflon® FEP is a registered trademark of Daikin Industries, Ltd.
Neoflon® is a registered trademark of Daikin Industries, Ltd.
NK Guard S series™ is a registered trademark of Nicca.
Post-It® notes are a registered trademark of 3M.
Powerade® is a registered trademark of The Coca-Cola Company.
Repellan KFC® is a registered trademark of Pulcra Chemicals.
Resist Spills and Releases Stains™ is a registered trademark of Nano-Tex.
Resist Spills™ is a registered trademark of Nano-Tex.
Rite in the Rain® is a registered trademark of JL Darling LLC.
RUCO® is a registered trademark of the Rudolf Group.
RUCO-COAT® is a registered trademark of the Rudolf Group.
RUCO-GUARD® is a registered trademark of the Rudolf Group.
RUCO-PROTECT® is a registered trademark of the Rudolf Group.
Rucostar® EEE6 is a registered trademark of the Rudolf Group.
RUCOSTAR® is a registered trademark of the Rudolf Group.
RUCOTEC® is a registered trademark of the Rudolf Group.
Scotchgard™ Fabric Protector is a registered trademark of 3M.
Sharpie® is registered trademark of Newell Brands.
Teflon® is a trademark of the Chemours Company (formerly E.I. DuPont de Nemours and Company).
Tefzel® is a registered trademark of the Chemours Company (formerly E. I. DuPont de Nemours and Company).
Trizma® is a registered trademark of the Sigma-Aldrich Company.
Tyvek® is a registered trademark of the Chemours Company (formerly E. I. DuPont de Nemours and Company).
Unidyne™ is a registered trademark of Daikin Industries, Ltd.
Ziploc® is a registered trademark of S. C. Johnson & Son.

[THIS PAGE IS INTENTIONALLY LEFT BLANK]

Michigan Department of Environmental Quality

MDEQ PFAS Sampling Quick Reference Field Guide[1]

All Items Used During Sampling Event

● Prohibited

• Items or materials that contain fluoropolymers such as
  ○ Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon®
  ○ Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®
  ○ Polycholotrifluoroethylene (PCTFE), that includes the trademark Neoflon ®
  ○ Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®
  ○ Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP
• Items or materials that contain any other fluoropolymer

Pumps, Tubing, and Sampling Equipment

● Prohibited	■ Allowable	▲Needs Screening[2]

• Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape)	• High-density polyethylene (HDPE)
	• Low-density polyethylene (LDPE) tubing
	• Polypropylene
	• Silicone
	• Stainless-steel
	• Any items used to secure sampling bottles made from:
	  ○ Natural rubber
	  ○ Nylon (cable ties)
	  ○ Uncoated metal springs
	  ○ Polyethylene
		• Any items or materials that will come into direct contact with the sample that have **not** been verified to be PFAS-free
		  ○ Do not assume that any sampling items or materials are PFAS-free based on composition alone

Sample Storage and Preservation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps	• Glass jars[4] • Laboratory-provided PFAS-Free bottles: ○ HDPE or polypropylene • Regular wet ice • Thin HDPE sheeting • LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media[6]	• Aluminium foil[4] • Chemical or blue ice[5] • Plastic storage bags other than those listed as ■ Allowable • Low-density polyethylene (LDPE) bottles

Field Documentation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Clipboards coated with PFAS • Notebooks made with PFAS treated paper • PFAS treated loose paper • PFAS treated adhesive paper products	• Loose paper (non-waterproof, non-recycled) • Rite in the Rain® notebooks • Aluminium, polypropylene, or Masonite field clipboards • Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers	• Plastic clipboards, binders, or spiral hard cover notebooks • All markers not listed as ■ Allowable • Post-It® Notes or other adhesive paper products • Waterproof field books

Decontamination

● Prohibited	■ Allowable	▲Needs Screening[2]
• Decon 90® • PFAS treated paper towel	• Alconox®, Liquinox®, or Citranox® • Triple rinse with PFAS-free deionized water • Cotton cloth or untreated paper towel	• Municipal water • Recycled paper towels or chemically treated paper towels

Clothing, Boots, Rain Gear, and PPE

● Prohibited	■ Allowable	▲Needs Screening[2]

• New or unwashed clothing
• Anything made of or with:
  ○ Gore-Tex™ or other water-resistant synthetics
• Anything applied with or recently washed with:
  ○ Fabric softeners
  ○ Fabric protectors, including UV protection
  ○ Insect resistant chemicals
  ○ Water, dirt, and/or stain resistant chemicals
	• Powderless nitrile gloves
	• Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners
	• Made of or with:
	  ○ Polyurethane
	  ○ Polyvinyl chloride (PVC)
	  ○ Wax coated fabrics
	  ○ Rubber / Neoprene
	  ○ Uncoated Tyvek®
		• Latex gloves
		• Water and/or dirt resistant leather gloves
		• Any special gloves required by a HASP
		• Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

Food and Beverages

● Prohibited	■ Allowable

• No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks.
  ■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE.
	• Brought and consumed only outside the vicinity of the sampling area:
	  ○ Bottled water
	  ○ Hydration drinks (i.e. Gatorade®, Powerade®)

Personal Care Products (PCPs) - for day of sample collection[6]

● Prohibited	■ Allowable	▲Needs Screening[2]
• Any PCPs[6], sunscreen, and insect repellent applied in the sampling area.	PCPs[6], sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands: **PCPs[6]:** • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs[6] **Sunscreens:** • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L'Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30 • Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 **Insect Repellents:** • OFF® Deep Woods • Sawyer® Permethrin	• Products other than those listed as ■Allowable

[1] This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

[2] Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

[3] **For surface water foam samples:** LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

[4] **For fish and other wildlife samples:** Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

[5] Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8˚F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

[6] Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

● - Prohibited ■ - Allowable ▲ - Needs Screening

www.epa.gov/research

Technical BRIEF

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

Methods and guidance for sampling and analyzing water and other environmental media

Background

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have been in use since the 1940s. PFAS are found in a wide array of consumer and industrial products. PFAS manufacturing and processing facilities, facilities using PFAS in production of other goods, airports, and military installations are some of the contributors of PFAS releases into the air, soil, and water. Due to their widespread use and persistence in the environment, most people in the United States have been exposed to PFAS. There is evidence that continued exposure above specific levels to certain PFAS may lead to adverse health effects. The U.S. Environmental Protection Agency (EPA) will continue to partner with other federal agencies, states, tribes, and local communities to protect human health and, where necessary and appropriate, to limit human exposure to potentially harmful levels of PFAS in the environment.

EPA's methods for analyzing PFAS in environmental media are in various stages of development and validation. The Agency is working to develop validated analytical methods for groundwater, surface water, wastewater, and solids, including soils, sediments, biota, and biosolids.

Drinking Water

Analysis of PFAS using Method 537.1

To assess for potential human exposure to PFAS in drinking water, EPA's validated Method 537.1 will ensure that both government and private laboratories can effectively measure 18 PFAS in drinking water, which is a critical step for estimating exposure and potential health risks to PFAS. EPA Method 537 was first published in 2009 to initially determine 14 different PFAS. In 2018, the method was updated to include 4 more PFAS, including the GenX chemical hexafluoropropylene oxide dimer acid (HFPO-DA).

Analysis of Short-Chain PFAS using Method 533

EPA developed and validated EPA Method 533 to target "short chain" PFAS (none greater than C_{12}), including perfluorinated acids, sulfonates, fluorotelemers, and poly/perfluorinated ether carboxylic acids. Many of these could not be analyzed using 537.1 due to physicochemical properties. In December 2019, EPA published Method 533, which includes a total of 25 PFAS (14 of the 18 PFAS in 537.1 plus an additional 11 "short chain" PFAS) and specifies isotope dilution quantitation.

In 2019, EPA published validated SW-846 Method 8327 for non-potable water and Method 533 for analysis of short-chain PFAS in drinking water.

Health Advisories

In May 2016, EPA issued drinking water health advisories for two types of PFAS: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). EPA's health advisories are non-regulatory and non-enforceable, and are intended to provide technical information to state agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

Non-Potable Water

Analysis of PFAS using SW-846 Method 8327

EPA developed a direct injection liquid chromatography tandem mass spectrometry method, EPA SW-846 Method 8327, that utilizes external calibration for analysis of 24 PFAS in non-potable water (not of drinking quality). After a multi-lab validation in surface water, groundwater, and wastewater effluent, EPA posted the validated SW-846 Method 8327 in June 2019 for public comment.

EPA SW-846 Method 8327 is available for public use while EPA is adjudicating public comments. Consistent with most SW-846 methods, EPA provides the method as guidance; the use of this method is not specified in any federal testing requirements. Method 8327 is designed for high-throughput applications and supports interim recommendations for groundwater contaminated with PFOA and PFOS; however, for some analytes and matrices, it may not be sensitive enough for very low-level (i.e., single ng/L) project requirements.

Non-Potable Water and other Environmental Media

Validation of SPE-ID Method for PFAS Analysis

EPA is collaborating with the Department of Defense's Naval Seas Systems Command Laboratory Quality and Accreditation Office and SGS-AXYS to validate a solid-phase extraction/isotope dilution (SPE-ID) method. The method will include solid matrices (e.g., soil, sediment, fish tissue, biosolids) in addition to non-drinking water aqueous matrices.

In addition to the 24 analytes included in draft SW-846 Method 8327, EPA plans to include additional analytes for the SPE-ID Method to include analytes recently added to EPA Method 537. Single-laboratory validation of the SPE-ID protocol is targeted for winter 2020 and multi-laboratory validation will likely follow in 2021.

Evaluating Methods for Total PFAS Assessments

EPA will also begin evaluating methods for total organic fluoride (TOF) analyses in 2020. An effective TOF method will facilitate broad assessments of total PFAS in environmental samples.

Developing Sampling and Storage Methods

EPA ran time-based studies on degradation or loss of target analytes during sample storage (45 days) and assessed the effects of different sample vessel materials (e.g., plastic, glass) on analyte recovery. Based on these sampling and storage studies, EPA methods under development will recommend using PFAS-free, plastic containers (e.g., high-density polyethylene containers); whole sample preparation; and sample holding times of 28 days. EPA will also develop guidelines for field sampling, which are critical for minimizing sample contamination and optimizing data quality for site characterization and remediation.

Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. For example, polytetrafluoroethylene products (tubing, sample containers, and sampling tools) are often used in sampling; however, since these products can contain PFAS, they cannot be used in sampling for PFAS. In addition, many consumer goods brought to a sampling site may contain PFAS that can contaminate samples. Field sampling and laboratory hygiene protocols are critical to ensuring that testing results reflect actual PFAS levels in the analyzed media. The Interstate Technology and Regulatory Council has summarized site characterization, sampling precautions, and analytical method issues and options through their fact sheet series.

Contacts

Technical Contacts

- Chris Impellitteri, impellitteri.christopher@epa.gov
- Schatzi Fitz-James, fitz-james.schatzi@epa.gov
- Cynthia Caporale, caporale.cynthia@epa.gov

Communications Contact

- Michelle Latham, latham.michelle@epa.gov

Additional Information

- **EPA Method 537.1**: *cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=343042&Lab=NERL*
- **EPA Method 533:** *epa.gov/dwanalyticalmethods/method-533-determination-and-polyfluoroalkyl-substances-drinking-water-isotope*
- **SW-846 Method 8327:** *epa.gov/hw-sw846/validated-test-method-8327-and-polyfluoroalkyl-substances-pfas-using-external-standard*
- **PFOA & PFOS Drinking Water Health Advisories:** *epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos*
- **UCMR3:** *epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule*
- **Interstate Technology and Regulatory Council PFAS Fact Sheets:** *pfas-1.itrcweb.org/fact-sheets/*
- **PFAS in Your Environment:** *epa.gov/pfas*
- **Clean-Up Information:** *clu-in.org/*

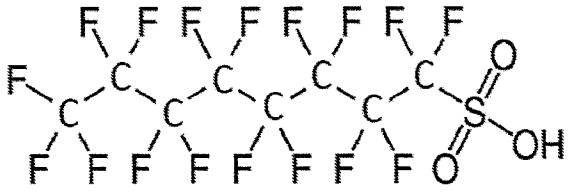
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

PFAS & Biosolids

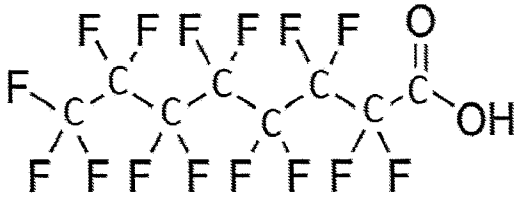
March 9, 2021 | DNR.WI.GOV

Brief PFAS Overview

- Brief Intro to PFAS
  - Over 4,000 PFAS Compounds
  - Chemistry of PFOS and PFOA



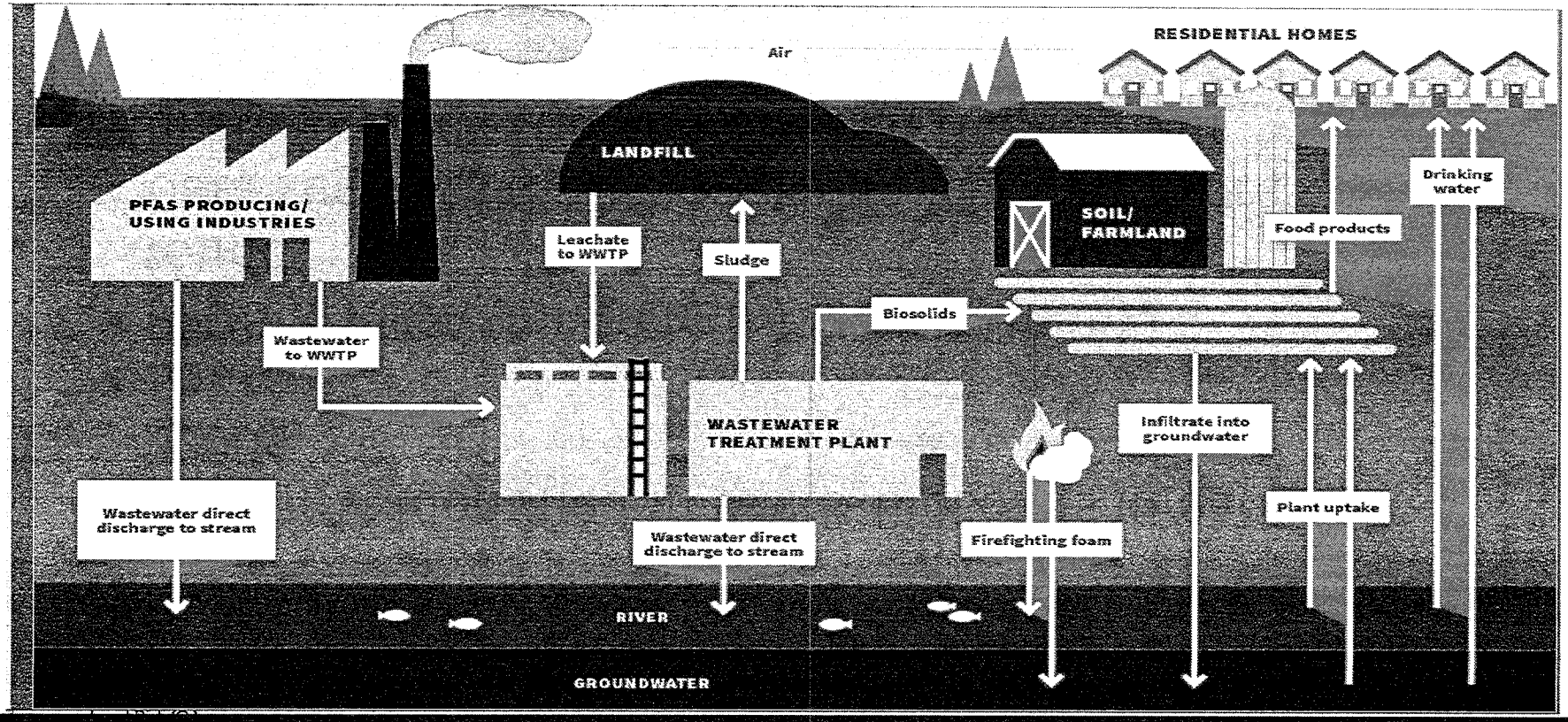
PFOS – perfluorooctanesulfonic acid



PFOA – perfluorooctanoic acid

  - Termed "Forever Chemicals" due to extremely strong bonds and resistance to degradation in the environment.

PFAS Fate & Transport



PFAS in Muni WW & Biosolid

- PFAS first identified in WW & Biosolids in early 2000s
- Sources
- PFOS & PFOA (long-chain) are commonly found
- Data suggests that short-chain PFAS are more likely to be discharged through the effluent while longer chain PFAS compounds are more likely accumulate in the sludge

Regulation of Biosolids in WI

- Federally Delegated Program from EPA
- Subject to 40 CFR Part 503 Requirements
- Chapters 283, Wis. Stats. and NR 204, Wis. Adm. Code.

WI Efforts on PFAS & Biosolids

- 2019 – Gather research, monitor EPA and state activity
- 2020 – Work closely with Great Lakes states like MI
  - Evaluate various models
- 2021 – Continue coordination with EPA & Other States
  - Develop Interim Strategy Approach

Draft Interim Strategy Approach

Goal of Interim Strategy

- Provide municipal operators an approach for handling and disposing PFAS-impacted biosolids in the interim
- SOURCE REDUCTION, SOURCE REDUCTION, SOURCE REDUCTION!!!
- Interim step or approach while we gather more data and waiting on EPA to conclude risk assessment

Draft Interim Strategy Approach

- PFAS Biosolids Sampling – included at permit reissuance
- PFAS Source Reduction – will be developing more content and sharing in the near term
- Farmer and Landowner Communication – will be developing messaging and sharing in the near term
- Additional internal review pending and looking to engage with stakeholders on a final approach prior to implementation.

PFAS Biosolids Sampling

- Sample and analyze biosolids for PFAS prior to land application.
- All Municipal WWTFs with a design flow over a million gallons and WWTFs that generate EQ/Class A product will monitor PFAS in the year they plan to land apply
- Lagoon, reed bed and other facilities will monitor prior to any land application and at least once during their 5-year WPDES permit cycle

Use of Analytical Results

- Tiered System
  - Below 50 micrograms per kilograms (µg/kg) of sum of PFOA/PFOS concentrations
    - 16 µg/kg concentration
  - 50 µg/kg – 150 µg/kg of sum of PFOA/PFOS concentrations
  - Above 150 µg/kg of sum of PFOA/PFOS concentrations

Below 50 µg/kg

- If over 16 µg/kg, implement PFAS source investigation and reduction. If below, no further action necessary prior to land application.
- Provide PFAS analytical results to the landowner prior to application
- Track application rates

50 µg/kg - 150 µg/kg

- Immediately notify DNR Staff
- Investigate potential sources to develop a source reduction program
- Reduce any future land application rates to no more than 1.5 dry tons per acre
- Provide PFAS analytical results to the landowner prior to application.
- Track application rates
- WWTF operators may decide to arrange for alternative disposal options.

Above 150 µg/kg

- Biosolids are considered industrially impacted by PFAS. Biosolids should not be land applied. Future WPDES permits likely to include language prohibiting land application above this level.
- Immediately notify DNR Staff
- Investigate potential sources to develop a source reduction program
- Arrange alternative disposal of biosolids (e.g., incineration or appropriate landfill)

Identify PFAS Sources

- Numerous potential industrial sources as discussed earlier
- Commercial sources can occasionally be a source of PFAS
- Reach out to your DNR contact to discuss a source identification and reduction plan. We are happy to assist your team.

Next Steps

- Discuss Interim Strategy internally and externally prior to implementation. This is key!
- Continue to partner with all WWTFs on PFAS efforts with an emphasis on PFAS source identification and reduction.
- Work with other states and EPA on PFAS efforts
- Review new information as it becomes available and revise strategy as appropriate.
- Keep an open dialogue!

CONNECT WITH US

/WIDNR

@WDNR

@WI_DNR

/WIDNRTV

"WILD WISCONSIN:
OFF THE RECORD"

LEAGUE OF WISCONSIN MUNICIPALITIES

131 W. Wilson St., Suite 505
Madison, Wisconsin 53703
phone (608) 267-2380; (800) 991-5502
fax: (608) 267-0645
league@lwm-info.org; www.lwm-info.org

July 30, 2021

Department of Natural Resources
Attn: Adam DeWeese– DG/5
101 S. Webster Street
Madison, WI 53703

Via Email – Adam.DeWeese@wisconsin.gov and DNRAdministrativeRulesComments@wisconsin.gov

RE: Comments on the Economic Impact Analysis for DG-24-19 Revisions to ch. NR 809 Related to the Promulgation of Drinking Water MCLs for PFOA and PFOS

Mr. DeWeese:

Please accept the submission of these comments on behalf of the League of Wisconsin Municipalities. The League, a nonprofit and nonpartisan association of 594 cities and villages, welcomes the opportunity to submit comments related to the Economic Impact Analysis on the revision to ch. NR 809 related to the promulgation of new drinking water maximum contaminant levels for PFOA and PFOS. We are submitting these comments on behalf of the municipally owned and operated water systems in the state.

Of primary importance, the League and our municipal water systems throughout the state strongly support providing safe reliable drinking water to our communities. There are approximately 611 municipal water systems in Wisconsin owned by cities, villages, towns, or sanitary districts including care and correctional facilities that are owned by counties or municipalities. They test the water for all regulated contaminants to ensure the protection of public health. In the 2020 Annual Drinking Water Report, DNR noted that more than 98% of Wisconsin's public water systems provided water that met all health-based maximum contaminant level (MCL) standards.

It is important to note that to date, all drinking water MCLs have been first established by EPA pursuant to the Safe Drinking Water Act (SDWA) process and then adopted by the State of Wisconsin. It is our understanding that Wisconsin has never adopted a drinking water MCL without a federal counterpart adopted prior to state action.

That being said, as the purveyors of safe and reliable drinking water, we understand the concerns associated with the presence of PFAS compounds in the environment and the potential health effects that are associated with these man-made chemicals. However, the League of Wisconsin Municipalities would like to highlight some significant issues with the department's proposed environmental impact analysis.

Lack of State Specific Information:

The department's EIA states that "Wisconsin has not conducted a comprehensive study of potential PFAS levels in public wells. Without such data, for the purpose of this Economic Impact Analysis, the

department at this time cannot predict the number of public water systems with MCL exceedances. The department used data from Michigan's 2017 – 2019 study of over 1,700 public water systems as a proxy for PFOS/PFOA data that are not yet available in Wisconsin." We would assert that the earlier laboratory testing techniques which generated this data were not sensitive enough to detect contamination amounts as low as 20 ppt. Therefore, the impacts associated with the previous Michigan sample may be skewed. In addition, as we understand the status, the department is still in the process of obtaining approval for sampling and testing protocols for conducting public water system testing of PFOA and PFOS in the state. EPA is also still in the process of completing research and studies on the best available treatment technologies for PFAS removal from drinking water (see appendix A). Therefore, the number of systems impacted in Wisconsin and the methods in which public water systems would be treated are both very tenuous at best at this time.

Costs Associated with the Environmental Impact Analysis:

The very nature of an economic impact analysis is to fully assess the economic impact of implementation and compliance of the proposed administrative rule revision. The analysis for ch. NR 809 is woefully inadequate listing that the department's preliminary assessment estimates the initial monitoring cost for all systems to be $1.025 million with an unknown cost for additional monitoring and an indeterminate impact for treatment. We believe that ratepayers have the right to fully understand the economic impacts that they will bear with approved MCLs for PFOA and PFOS. Even if Safe Drinking Water loans are potentially available for capital costs, that funding mechanism is still a loan and must be repaid with interest, therefore impacting ratepayers and communities.

In Wisconsin, the city of Eau Claire conducted voluntary PFAS testing at DNR request. None of those tests at the entry point exceeded DNR recommended enforcement standards proposed through this rulemaking process, yet out of an abundance of caution, it has removed from service and shut off four wells due to a single-entry point exceedance of the Department of Health Services hazard index, an unpromulgated, non-regulatory guidance parameter that is typically used with Superfund sites. This hazard index exceedance prompted further testing of each well on the City's system and by-weekly tests thereafter even though a subsequent entry point test showed PFAS levels well under the recommended enforcement standards and also well under the hazard index non-regulatory guidance parameter.

The city continues to be proactive and cooperatively pursuing treatment and mitigation options with DNR for those specific wells most affected and to avoid impacts to other wells now supplying the City safe drinking water. Those options are all novel to the city and DNR. Treatment or diversion methods are not able to remove PFAS from the environment, just from the drinking water, leaving unresolved what to do with the contaminate following removal and without resolution for how to remediate the environment. And treatment, diversion, and disposal options, as they exist, are all very expensive.

The four Eau Claire city wells voluntarily shut down combine to pump approximately 6,000 gpm. In Woodbury, MN a temporary water treatment plant was constructed to remove PFAS after Woodbury's groundwater supply was found to contain elevated levels of PFAS. After hydraulic modeling and a mitigation feasibility study was completed, Woodbury's temporary treatment plant was built with the capacity to treat 3,800 gpm at a cost $8.7 million. Eau Claire's output from just it's four wells with detects for PFAS is almost double that volume and in total its wastewater treatment plant pumps 10-14 million gallons per day, undoubtably requiring a much larger facility at presumably multiple orders of magnitude to treat for PFAS. In addition, that cost accounts only for the actual capital expenditure and not

LEAGUE OF WISCONSIN MUNICIPALITIES
131 W. Wilson St., Suite 505
Madison, Wisconsin 53703
phone (608) 267-2380; (800) 991-5502
fax: (608) 267-0645
league@lwm-info.org; www.lwm-info.org

the additional annual operating, maintenance, and more frequent sampling, hydro-geologic analysis, diversion options, or any disposal costs. Currently, the city is sampling every two weeks to monitor levels. Also, keep in mind that treatment technologies or requirements could be modified as EPA is still conducting and finalizing research.

The City of Rhinelander also has two wells that were voluntarily shut down due to PFAS variant detects in 2019. Those two wells provided twenty-five percent of the city's water supply. The city is now analyzing treatment options and have received estimates as high at $3.5 million which again only accounts for the initial capital costs and not for additional necessary financial components including annual operations, maintenance, more frequent sampling, testing, and analysis, potential hydro-geologic analysis, diversion options, or any disposal costs. As research and technology around treatment is evolving, the city has issued a call-out to academic, professional engineers and consultants to utilize Rhinelander's situation as a test-case. This proactive work is occurring all the while state and federal standards are being contemplated. Since 2019, the city has been testing its wells monthly at a significant cost, however, currently, the city is sampling its other five wells quarterly still at a significant cost to ratepayers annually. The city continues to be proactive and cooperatively pursuing treatment and mitigation options with DNR for those specific wells most affected and to avoid impacts to other wells now supplying the City safe drinking water.

To illustrate this point further, the State of New Hampshire originally proposed a PFOA MCL of 38 ppt and a PFOS MCL of 70 ppt (much higher than Wisconsin's recommended MCLs) and prepared an economic impact analysis for those standards. After public comment, the standards were lowered to 12 ppt for PFOA and 15 ppt for PFOS (now similar to what is being proposed in Wisconsin). An updated EIA was then prepared. If we conservatively estimate the costs for compliance in New Hampshire, the annual debt service for two years for the initial capital costs is approximately $7.5 million and the annual operations and maintenance costs are $13.8 million combined with an annual sampling cost of approximately $350,000. Because this economic analysis is from a smaller state with fewer systems overall, we assert that Wisconsin's economic impact from compliance with the recommended MCLs must be more reasonably estimated in excess of the state of New Hampshire's two-year costs of $21.7 million.

The department has insufficiently examined the overall economic impact of the PFOA and PFOS maximum contaminant levels. This does a disservice to the state and our member communities that Wisconsin residents rely upon to provide them with safe drinking water. An accurate economic impact of PFAS regulation is necessary to inform state economic assistance that will be needed to allow local communities and water utilities to respond and continue to provide the public safe drinking water we all expect. The League respectfully requests that the department review the complete and encompassing costs associated with these new regulations including research and development of effective treatment and disposal options, capital costs (regardless of Safe Drinking Water loans) to construct or install treatment methods, secondary capital costs associated with treatment including additional piping, connection systems and pumping facilities and disposal costs, interest accrued on debt, annual operations and maintenance, increased sampling, testing and analysis requirements.

In addition, the League fully endorses the entirety of the comments submitted by Lawrie Kobza on behalf of the Municipal Environmental Group – Water Division (MEG--Water) on July 28, 2021. We urge you to consider the recommendations submitted by MEG – Water.

Thank you for the opportunity to provide comments on the Environmental Impact Analysis for NR 809, we look forward to reviewing the modified EIA that takes into consideration the public comments and to continuing the dialogue with the department on this important issue. The League continues to be supportive of safe drinking water standards and regulating these emerging compounds in a scientifically sound and technically and economically feasible manner.

Kind Regards,

Toni R Herkert
Toni Herkert, Government Affairs Director
Wisconsin League of Municipalities

LEAGUE OF WISCONSIN MUNICIPALITIES
131 W. Wilson St., Suite 505
Madison, Wisconsin 53703
phone (608) 267-2380; (800) 991-5502
fax: (608) 267-0645
league@lwm-info.org; www.lwm-info.org

Appendix A

US Environmental Protection Agency - Status of EPA Research and Development on PFAS
https://www.epa.gov/chemical-research/status-epa-research-and-development-pfas#methods

Drinking Water Treatment Options - EPA researchers are evaluating different drinking water treatment technologies that can remove certain PFAS from drinking water systems.

Title	Description	Status/Timeline	More Information
Pilot-scale Water Treatment for PFAS	Manuscripts on the efficacy of drinking water treatment methods at the pilot scale.	Expected 2022.	No further information at this time.
Drinking Water Ion Exchange Treatment Performance Models	Drinking water treatability manuscripts and corresponding models for ion exchange (IX).	Expected 2022.	No further information at this time, but learn more about Ion Exchange treatment at EPA's Drinking Water Treatability Database.
Drinking Water Point of Use and Point of Entry Devices	Studies on the efficacy of off-the-shelf, commercially available household water treatment systems. Studies will evaluate granular activated carbon (GAC), reverse osmosis (RO), and ion exchange (IX) treatment systems.	Studies for GAC and RO systems are complete. The IX study is underway, and EPA expects to complete the study in 2021.	GAC and RO study available here. EPA also published a plain-language article about this work in EPA's Science Matters. Learn more about GAC, RO, and IX treatment methods in this Science Matters article.
Drinking Water Treatability Database	Evaluation of technologies for removal of PFAS from drinking water. Will include performance and cost data, as well as models and tools to help communities determine optimal treatment choices.	Ongoing.	As of July 2020, EPA has updated the Database with information on treatment information for 26 PFAS chemicals. Access the Drinking Water Treatability Database here.
Reactivation of PFAS-Laden Granular Activated Carbon (GAC)	Development of proper operating parameters for reactivation of GAC after removal of PFAS from water. In collaboration with the U.S. Department of Defense.	Expected 2021.	No further information at this time.
Incineration of Spent Granular Activation Carbon (GAC) and Ion Exchange (IX)	Studying the incineration of spent GAC and IX adsorption materials that have been used in water treatment applications for PFAS removal. In collaboration	Expected 2021.	No further information at this time.

Title	Description	Status/Timeline	More Information
	with the U.S. Department of Defense.		

MEG Water Division
Municipal Environmental Group

P.O. Box 927
Madison, WI 53701-0927
Telephone (608) 283-1788
Facsimile (608) 283-1709

July 28, 2021

FILED VIA EMAIL

Department of Natural Resources DNRNR809Comments@wisconsin.gov
Attn: Adam DeWeese - DG/5
P.O. Box 7921
101 S. Webster Street
Madison, WI 53707-7921

RE: Comments on Economic Impact Analysis for DG-24-19
Revisions to ch. NR 809 related to the promulgation of new drinking water MCLs for PFOA and PFOS

Dear Mr. DeWeese:

These comments are filed on behalf of the Municipal Environmental Group - Water Division (MEG - Water). MEG - Water is an association of 69 municipal water systems that provides input on legislative and regulatory issues involving water supply.

The Department has prepared a draft Economic Impact Analysis (EIA) and is soliciting comments and additional information before finalizing its EIA and submitting it to the Legislative Council. As the Department recognizes, Wis. Stat. § 227.137(3)(b) requires the Department to provide an estimate of the total implementation and compliance costs that are reasonably expected to be incurred by or passed along to businesses, local government units, and individuals, expressed as a *single dollar figure*. The Department must also make a determination as to whether $10 million or more in implementation or compliance costs are reasonably expected to be incurred by or passed along to businesses, local government units, and individuals *over any 2-year period* as a result of the proposed rule.

In its draft EIA, the Department has provided a preliminary assessment of initial monitoring costs to be $1.025 million and states that "[m]itigation and monitoring costs are unknown." With respect to the question whether implementation and compliance costs would be $10 million or more over any 2-year period, the draft EIA states: "Indeterminate. The department is seeking public comment to fully assess the economic impact of implementation and compliance with the proposed rule."

In light of the Department's lack of information for the State of Wisconsin, MEG-Water submits that the Department should look to the economic analysis prepared by the State of New Hampshire. New Hampshire originally proposed a PFOA MCL of 38 ppt and a PFOS MCL of 70 ppt and prepared an economic analysis for those standards. **Attachment A** to these comments is New Hampshire's January 2019 document describing its original economic analysis. After public comment, New Hampshire lowered its final standards to a PFOA MCL of 12 ppt and a PFOS MCL of 15 ppt (comparable to what is being proposed in Wisconsin). New Hampshire

then updated its economic analysis for the lower limits. **Attachment B** is New Hampshire's updated economic analysis.

New Hampshire's economic analysis shows that its PFAS standards at the low end of its economic estimate will have more than a $10 million impact over a 2-year period.

	From New Hampshire Economic Analysis* *Low End of Estimated Range*	2-Years of Costs
Initial Treatment Costs (Capital)	$65,046,987	
Annual Debt Service for Initial Treatment	$3,783,110 **	$7,566,220
Annual O&M Costs	$6,914,552	$13,829,104
Initial Sampling	$1,102,500	
Annual Sampling	$174,257	$348,514
TOTAL		**$21,743,838**

*Source: New Hampshire Department of Environmental Services, Rules Related to Per- and Polyfluoroalkyl Substances (PFAS), Summary of Comments on Initial Proposals with NHDES Responses, June 28, 2019, Attachment 2: Update on Cost and Benefit Considerations, page 3.

**Assumes financing of initial treatment project with Safe Drinking Water Loan Program for 20 years at the current interest rate of 1.485%.

Given this economic analysis information from a smaller state with fewer systems,[1] and given the Department's lack of its own information, MEG-Water believes that the Department's reasonable estimate of the economic impact from Department's proposed PFOS/PFOA standard must exceed $10 million over a 2-year period. MEG-Water does not believe the Department has sufficient information to conclude otherwise.

MEG-Water also offers the following comments on the draft Economic Impact Analysis.

1. The Department's preliminary assessment estimates the initial monitoring cost for all systems to be $1.025 Million. It appears that this estimate was calculated by multiplying the number of entry point samples to be collected by the cost of sample analysis. No costs were included for the costs a system would incur to retain outside assistance to collect the samples. PFAS sampling requires a heightened level of rigor to avoid cross-contamination and achieve the level of accuracy and precision required given the very low parts per trillion standards. MEG-Water believes that outside sample collection costs should be included in the estimate.

[1] New Hampshire has 1,575 public water systems (not including TNCWS) and a population of approximate 1.6 million. Wisconsin has 1,975 public water systems and a population of 5.822 million.

2. The draft EIA states that "Wisconsin has not conducted a comprehensive study of potential PFAS levels in public wells. Without such data, for the purpose of this Economic Impact Analysis, the department at this time cannot predict the number of public water systems with MCL exceedances." It is our understanding that the Department will be conducting PFAS testing at approximately 100 public water utilities beginning this fall. This information would provide information that the Department could use to evaluate the economic impact from this rule in Wisconsin. Proceeding with the EIA before this testing is done seems premature.

3. The Department notes that several states have completed sampling programs that provide occurrence data that can be referenced for comparison. MEG-Water has reviewed the information cited in Attachment A of the draft EIA and it is unclear whether the Department is comparing apples-to-apples. Attachment A identifies the number of systems sampled in Ohio, Michigan and New Hampshire, but it is not clear that the number really refers to systems, instead of referring to entry points (like Table 1 does in the draft EIA for Wisconsin) or water sources (wells). If Attachment A does refer to systems, it is unclear whether it refers to both community and non-transient non-community (NTNC) public water systems or only community systems. New Hampshire's number, for example, appears to only include municipal systems.

4. For Wisconsin's program, the Department provided numbers on the "entry points" to be sampled. The number of entry points a municipal system has varies depending upon how the system is configured. For example, it is MEG-Water's understanding that the Madison Water Utility has 21 wells and 21 different entry points, while Eau Claire has 16 wells and only 1 entry point. The different configurations of water systems will have a significant impact on where and how remediation is installed, the amount of water to be treated, and the cost of that remediation. Information from one system cannot be extended to other systems that would have very different configurations.

5. Regarding mitigation costs, the draft EIA states that the three main options for mitigating PFAS in drinking water are to (1) drill a new well not affected by PFAS, (2) abandon the affected source, or (3) install treatment. MEG-Water believes that this characterization of mitigating PFAS in drinking water is too simplistic. As to the first alternative, if the groundwater is contaminated by PFAS, a water system cannot assume that it will be able to escape the PFAS by simply drilling a new well. Significant investigation will need to take place before drilling a new well and the cost of this investigation must be included in the EIA. The Department's $11,000 estimate for a small system (presumably a non-community system) to drill a new well does not include this investigative cost or any property acquisition costs for a new well site.

As to the second alternative, abandoning an impacted well, and losing the capacity provided by that well, is not a mitigation measure. The cost of replacing that abandoned well, either with a new well or by connecting to another source, must be included in the EIA.

In MEG-Water's view, the third alternative -- the installation of treatment -- is the mitigation measure that should be evaluated in the EIA. The costs of treatment include both capital costs and yearly operation and maintenance costs. With respect to capital costs, the Department stated in the draft EIA that the Department anticipates that municipalities will use the Safe Drinking Water Loan program (SDWLP) to finance the cost of compliance. Even if

municipalities use the SDWLP to finance the capital costs of the installed treatment, municipalities will be responsible for the yearly debt service for the capital costs of the installed treatment system. As the Department notes, the typical loan period for one of these loans is 20 years.

With respect to the comparison to New Hampshire's economic analysis discussed on page 2 of this letter, MEG-Water included 2 years of debt service for capital costs to address PFOS/PFOA in the analysis assuming capital costs were financed at the interest rate available under the SDWLP. In New Hampshire, two years of annual debt service and operation and maintenance costs were estimated to exceed $20 million.

6. The draft EIA states that the process for this proposed rule is consistent with the process for establishing rules of other drinking water contaminants regulated under the federal Safe Drinking Act. MEG-Water disagrees. This rulemaking is not consistent with SDWA rulemaking.

When EPA promulgates federal drinking water standards, it follows the SDWA standard-setting process. Under the SDWA standard-setting process, a health goal is set that considers risks to the most sensitive populations including infants, pregnant women, and the immuno-compromised. The next step sets the MCL to be as close to the health goal as feasible, considering available treatment technologies and costs. This cost-benefit analysis is a critical component of the SDWA standard-setting process.

Under the SDWA standard-setting process, drinking water standards are not set at the lowest possible level regardless of cost, treatment feasibility, and relative health benefits. The SDWA cost-benefit analysis provides assurance that the health benefits achieved by a new standard justifies the cost of meeting that standard, and that comparable health benefits could not be achieved with a higher standard that would be less costly to meet.

The Department has not followed the SDWA standard-setting process for this rulemaking. The Department has not conducted a cost-benefit analysis of the proposed state standards. The Department has not considered whether comparable health benefits could be achieved with a higher standard and a lower cost.

The cost differential between different standard levels is large. The American Water Works Association estimated those costs in an August 8, 2019 comment letter to the Congressional Budget Office (**Attachment C**). In that submission, AWWA estimated capital costs and annual operation and maintenance cost would increase by 250% if the PFOA/PFOS standard was 40 ppt instead of 70 ppt, and it would increase by another 400% if the PFOA/PFOS standard was set at 20 ppt instead of 40 ppt.

The relevant charts from this AWWA letter to the Congressional Budget Office are reproduced below.

National Capital Cost to Install Treatment

Treatment Objective	Capital Costs ($ millions)		
	Granular Activated Carbon	Ion Exchange	Reverse Osmosis
< 70 ng/L	$2,100 - $4,400	$1,900 - $4,100	$5,700 - $12,000
< 40 ng/L	$5,600 - $12,000	$5,400 - $12,000	$15,000 - $33,000
< 20 ng/L	$23,000- $50,000	$22,000 - $48,000	$63,000 - $140,000
Treatment Technique	$140,000 - $290,000	$130,000 - $280,000	$370,000 - $800,000

National Annual Operating and Maintenance Cost for Installed Treatment

Treatment Objective	Annual Recurring Costs ($ millions)		
	Granular Activated Carbon	Ion Exchange	Reverse Osmosis
≤ 70 ng/L	$44 - $90	$210 -$460	$190 - $410
≤ 40 ng/L	$110 - $240	$540 - $1,200	$480 -$1,000
≤ 20 ng/L	$460 - $980	$2,200 - $4,800	$2,000 - $4,200
Treatment Technique	$2,700 - $5,800	$13,000 - $28,000	$12,000 - $25,000

The Department has done no analysis to evaluate whether the incremental health benefits achieved from a 20 ppt PFOS/PFOA standard justifies the costs of meeting that standard or whether comparable health benefits could be achieved with a higher standard that would have substantially lower costs. This is the type of sensible cost-benefit analysis that would be done under the SDWA.

Public water systems are charged with protecting public health and they take this responsibility extremely seriously. Public water systems currently face a host of expensive challenges to ensure the continued protection of public health -- like eliminating lead service lines, replacing old infrastructure, implementing corrosion control treatment to prevent leaching from lead pipes, and treating for contaminants like radium, arsenic, and nitrate. At the same time, there are concerns about public water supply remaining affordable.

As we respond to emerging contaminants, like PFAS, it is important that these emerging contaminants receive the same scrutiny and analysis as was given to the contaminants that already have MCLs. MEG-Water believes this is best done by having EPA develop federal drinking water standards for PFAS using the SDWA standard-setting process. If drinking water standards for PFAS are established based upon the same uniform and consistent methodology used to establish standards for other drinking water contaminants, public water systems and the

public at large can be assured that PFAS is receiving the attention and resources that it deserves.

Thank you for this opportunity to provide the Department with our input on the draft EIA. If you have any questions, please do not hesitate to contact us.

Sincerely,

MUNICIPAL ENVIRONMENTAL GROUP – WATER DIVISION

/s/ Lawrie J. Kobza

Lawrie J. Kobza
Legal Counsel

cc: MEG - Water Members (*via email*)

ATTACHMENT A

R-WD-19-01

SUMMARY REPORT ON THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES DEVELOPMENT OF MAXIMUM CONTAMINANT LEVELS AND AMBIENT GROUNDWATER QUALITY STANDARDS FOR PERFLUOROOCTANESULFONIC ACID (PFOS), PERFLUOROOCTANOIC ACID (PFOA), PERFLUORONONANOIC ACID (PFNA), AND PERFLUOROHEXANESULFONIC ACID (PFHxS)

Prepared by
New Hampshire Department of Environmental Services

Robert R. Scott, Commissioner
Clark B. Freise, Assistant Commissioner

January 4, 2019

PO Box 95, Concord, NH 03302-0095
www.des.nh.gov | DWGBInfo@des.nh.gov

TABLE OF CONTENTS

LIST OF COMMON ACRONYMS

AGQS – Ambient Groundwater Quality Standard

ATSDR – Agency for Toxic Substances and Disease Registry

CDC – Centers for Disease Control

COC – Contaminant of Concern

DWEL – Drinking Water Equivalency Level

EPA – United States Environmental Protection Agency

HED – Human Equivalent Dose

MCL – Maximum Contaminant Level

MRL – Minimum Risk Level

NHDES – New Hampshire Department of Environmental Services

NHDHHS – New Hampshire Department of Health and Human Services

NOAEL – No Observed Adverse Effect Level

PFAS – Per- and polyfluoroalkyl substances

PFHxS – Perfluorohexanesulfonic Acid

PFOA – Perfluorooctanoic Acid

PFOS – Perfluorooctanesulfonic Acid

PFNA – Perfluorononanoic Acid

PoD – Point of Departure

PWS – Public Water System

RfD – Reference Dose

RSC – Relative Source Contribution Factor

SDWA – Safe Drinking Water Act

UFs – Uncertainty Factors

1. Background

Perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), and perfluorohexanesulfonic acid (PFHxS) are part of a large class of chemicals known as perfluorinated compounds (PFCs) and more broadly as per- and polyfluoroalkyl substances (PFAS). They have been widely used since the 1940s in commercial, industrial, and household products and applications, including production of water resistant materials, fire suppression foams, non-stick cookware, stain removers, etc. All four compounds have been detected in New Hampshire's groundwater and surface water. Because of their widespread use, persistence and mobility in the environment and bioaccumulative properties, these compounds have been detected in blood serum in humans and animals worldwide and have been studied for their toxicity and health effects. The health effects associated with PFAS exposure are currently being researched extensively by toxicologists and epidemiologists worldwide, resulting in numerous publications being released on a continuous basis. The New Hampshire Departments of Environmental Services (NHDES) and Health and Human Services (NHDHHS) continue to review and evaluate the toxicity and health effects of these compounds as research becomes available. According to the Centers for Disease Control's (CDC) Agency for Toxic Substances and Disease Registry (ATSDR), some, but not all, studies in humans have shown health effects possibly associated with PFAS exposure including:

- Altered growth, learning and behavior of infants and older children.
- Lowering a woman's chance of getting pregnant.
- Interference with the body's natural hormones.
- Increased cholesterol levels.
- Modulation of the immune system.
- Increased risk of certain cancers.

For additional information on the toxicity and health effects of these compounds, please visit the ATSDR webpage at: https://www.atsdr.cdc.gov/pfas/health-effects.html.

New Hampshire Chapter Laws 345 of 2018 (i.e., SB309, see Appendix 1) authorize NHDES to consult with NHDHHS and to initiate rulemaking to adopt maximum contaminant levels (MCLs) for PFOA, PFOS, PFHxS and PFNA by January 1, 2019. The legislation requires that NHDES consider, 1) the extent the contaminant is found in New Hampshire; 2) the ability to detect the compound; 3) the ability to treat the contaminant; 4) benefits associated with adopting an MCL; and 5) the costs associated with adopting an MCL. MCLs are water quality standards that apply to public water systems (PWS). Most MCLs , including those proposed in this report, are set for long-term, chronic exposure to a contaminant and only apply to non-transient public water systems (water systems serving 25 or more of the same population of people, six months of the year). Public water systems (PWS) sample all of their water sources for compounds with MCL standards, and submit the results to NHDES to demonstrate compliance with water quality standards.

Existing state law requires NHDES to adopt rules establishing Ambient Groundwater Quality Standards (AGQS) that are the same as any MCLs established by NHDES. Existing state law also requires that AGQS be the same or more stringent than any federal MCL or health advisory established under the federal Safe Drinking Water Act (SDWA). AGQS are the standards used to require site investigations and remedial action at and around contamination sites. AGQS are also used to identify where the provision of alternative drinking water is required when contaminated sites impact offsite private and/or public water supply wells. An AGQS also dictates the conditions under which wastewater and wastewater residuals may be discharged to groundwater. Although NHDES adopted an AGQS for PFOA and PFOS of 70 nanograms per Liter (ng/L) [or

parts per trillion (ppt)[1]] for these two compounds combined in May of 2016, the laws enacted in 2018 require NHDES to re-assess these standards and to also adopt AGQS for PFHxS and PFNA.

This report provides information on how New Hampshire's proposed MCLs and AGQSs for PFOA, PFOS, PFNA and PFHxS were developed to ensure they are protective of human health at all life stages. The report also provides information on the criteria that the law requires NHDES to consider when establishing MCLs including: occurrence in drinking water, the ability to detect the contaminant, the ability to treat to achieve compliance with the MCLs, and the costs and benefits to parties affected by establishing the standards.

It is important to note that New Hampshire, like most other states, has always relied on the U.S. Environmental Protection Agency (EPA) to set MCLs. EPA and the few other states that set drinking water standards employ a variety of experts who derive protective health-based standards (e.g., toxicologists and health risk assessors), economists trained in cost and benefit analysis, and chemists and engineers who can determine lab and treatment capabilities. SB309 included funding for a toxicologist and health risk assessor, who both began work at NHDES on October 12, 2018. NHDES was also able to engage the services of an outside expert to provide some additional assistance in the review of toxicological information. NHDES did not have resources to fully evaluate costs and benefits, as would have been done on the federal level, but has attempted to provide an analysis of each based upon available information.

The majority of the work NHDES has performed to date has been focused on deriving the individual standards for PFOA, PFOS, PFNA and PFHxS. During the rulemaking process, NHDES expects to continue researching health studies on these chemicals as well as risk management approaches that are scientifically valid and could address any compounding effects between chemicals when the chemicals are found in combination in a drinking water source. Further exploration on quantifying benefit to affected parties will also occur. This continued effort will be done in tandem with considering public comments received on the initial rule proposal.

2. Proposed MCLs and AGQSs

Establishing MCLs is done in accordance with guidance developed by EPA and other health agencies and programs. Details of how health protective drinking water standards are usually developed are presented in Appendix 2. The sequence of steps is summarized below:

- The most sensitive adverse effect that is thought to be relevant to humans is chosen. The lowest dose that has no significant toxic effect is the usual initial starting point (a no observed adverse effect level or NOAEL).

- The NOAEL or the *lowest* observed adverse effect level (LOAEL), if there is no NOAEL, is converted to a human equivalent dose (HED) through physiological models or other dose adjustment methods. The HED becomes the point of departure (PoD) for deriving the ultimate drinking water standard.

- The PoD is reduced by uncertainty factors (UFs) of either 10- or 3-fold to take into account incomplete knowledge regarding critical factors such as when there is incomplete knowledge of human variability and sensitivity; in cases where short-term studies are used to protect against

[1] Both the MCL and the AGQS are specified in nanograms per Liter (ng/L), a unit of concentration that is equivalent to parts per trillion (ppt) in water. In this document, concentrations are stated in ppt except in quoted references and tables that use ng/L.

effects from long-term exposure, and when the usual required studies to set a standard (e.g., reproductive effects studies, developmental studies or cancer studies) are missing.

- The toxicity value developed, which EPA refers to as a Reference Dose (RfD) and ATSDR refers to as a Minimal Risk Level (MRL), is converted to an equivalent dose in drinking water by selecting a sensitive human receptor and using their body weight and drinking water ingestion rate to calculate a drinking water equivalency level (DWEL). The DWEL is 100% of a dose not expected to cause any toxic effects to even the most sensitive subpopulation.

- For most chemicals, exposure from sources other than drinking water, such as from air, food and soil, is also possible. Therefore, the DWEL must be reduced by estimated doses coming from all other potential sources using a relative source contribution factor (RSC), so that the total exposure dose does not exceed 100% of the RfD, MRL or DWEL.

It is important to understand that drinking water standards for the same chemical often differ depending on the entity setting them. This is not unexpected, since standard setting guidance is not simply a mathematical formula and anticipates the need for professional judgment, which is involved in several stages of the standard setting process. Information about the relevancy of effects on animals to humans is often incomplete and contradictory, which will influence the toxic effect that is chosen. The selection of appropriate UFs is another area where judgment is critical. Whether a full UF of 10 or a partial one of 3 is used for an UF, it will change the resulting standard by just over 3-fold. The RSC chosen can also have a significant influence on the final standard. If one Risk Assessor determines that the data required to select an RSC are inadequate, EPA's guidance recommends using a default RSC of 20%. Another Assessor may determine the data on background exposure are adequate and choose an RSC of 60% based on them. The choice between those two RSCs will also change the standard selected by 3-fold. In a world of complete knowledge about a chemical's effects, relevance to humans and background exposure, health-protective drinking water standards calculated by different practitioners should be identical. However, in the real world, the lack of knowledge about a chemical and the appropriate degree of protectiveness to apply in the face of uncertainty results in differing choices, which can change the value selected for a standard.

In order to ensure that NHDES was aware of all the current, relevant health studies and information available in deriving the proposed MCLs/AGQSs, the agency solicited input from stakeholders through a series of public meetings held for this purpose. A list of the documents/references received following these meetings is available on the NHDES website at: https://www4.des.state.nh.us/nh-pfas-investigation/wp-content/uploads/2018/11/Draft_PFAS-Reference-List-as-of-11-07-18_For-Posting-to-Website.pdf. Comments received are available on the NHDES website at: https://www.des.nh.gov/organization/commissioner/max-contaminant-levels.htm. Studies selected and utilized in the derivation of the standards are listed in Appendix 8.

The following Table (Table 1) provides an overview of the proposed derived standards and the factors selected to derive the proposed MCL/AGQS. Appendices 4-7 include a description for each of the chemicals and how the standard was derived. These derivations were reviewed by Dr. Stephen M. Roberts, Ph.D., who also assisted NHDES with the review of ATSDR's Draft Toxicological Profile released in June 2018. In addition to the individual standards for PFOA and PFOS, the proposed rulemaking keeps the combined 70 ppt for PFOA and PFOS as an AGQS and also proposes that it be adopted as an MCL. This is consistent with existing law, which requires that an AGQS shall be no less stringent than an EPA health advisory.

Table 1: Summary of MCL Derivation Factors				
	PFOA*	PFOS*	PFHxS	PFNA
Health Effect Endpoint	Altered Liver Size/Function	Delayed Development	Impaired Reproduction	Altered Liver Size/Function
Animal Serum Dose (ng/mL)	4,351[a]	6,260[b]	27,200[c]	4,900[d]
Total Uncertainty Factor HUF x AUF x MF[e]	100 10 x 3 x 3	100 10 x 3 x 3	300 10 x 3 x 10	300 10 x 3 x 10
Target Human Serum Dose (ng/mL)	43.5	62.6	90.7	16.3
Human Half-life (years)	2.7[f]	3.4[f]	5.3[f]	2.5[g]
Dosimetric Adjustment Factor (L/kg/d)	$1.20E^{-04}$	$1.28E^{-04}$	$1.03E^{-04}$	$1.52E^{-04}$
Reference Dose (ng/kg/d)	5.2	8.0	9.3	2.5
Relative Source Contribution[h]	40%	50%	50%	50%
Water Ingestion Rate[i]	0.055 L/kg d	0.055 L/kg d	0.055 L/kg d	0.055 L/kg d
MCL/AGQS ppt (ng/L)	**38**	**70[j]**	**85**	**23**

[a] Loveless et al., 2006, NJ DWQI 2017, increased relative liver weight in mice;
[b] Luebker et al., 2005a, EPA 2016b, reduced pup weight and developmental delays in rats;
[c] Chang et al., 2018, reduced litter size in mice;
[d] Das et al., 2015, NJ DWQI 2018, increased relative liver weight in mice;
[e] HUF (Human-to-Human Uncertainty) x AUF (Animal-to-Human Uncertainty) x MF (Modifying Factor)
[f] Li et al., 2017, serum-derived half-life estimates from men and women exposed to PFAS via drinking water;
[g] Zhang et al., 2013, ATSDR 2018, urine-derived half-life from community exposure to PFNA;
[h] The RSC was derived using NH-specific blood data from high-exposed populations of Pease and Southern NH. This was calculated using the subtraction method described in the EPA 2000 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health. Details about this approach are summarized in Appendices 4-7;
[i] EPA 2011 Exposure Factors Handbook, lactating women 95th percentile;
[j] PFOS rounded down to 70 ppt from 73 ppt, per the current EPA Health Advisory for PFOS.

*The derivation of the 70 ppt standard for PFOA and PFOS combined is based on the U.S. Environmental Protection Agency's November 2016 Health Advisory (https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos)

Each MCL/AGQS was calculated through a risk assessment process that: 1) assessed sensitive and human-relevant health effects of each PFAS in rodent models, 2) evaluated non-cancer endpoints due to uncertainty about cancer endpoints observed in rodent models, and 3) estimated health-protective doses for exposure to individual compounds across sensitive life stages. Under State law, development of MCLs necessitates evaluation of, and possible modification based on, the availability and accuracy of detection and treatment technology, as well as the costs associated with compliance. While these factors were considered, NHDES has determined that, for these compounds at this time, adjustments to the standards based on detection/treatment technology or projected compliance costs are not warranted, as both technology challenges and compliance costs can be addressed by means other than standards that do not adequately protect health. Therefore, NHDES has proposed the health-protective levels calculated using the science-based process as both the drinking water standard and the ambient groundwater standard for New Hampshire.

Animal studies, namely rodents, served as the basis for the derived dose of each MCL/AGQS. Human epidemiology studies were evaluated to identify relevant health effects observed in rodent models, but did not serve as the basis for dose calculation. The use of animal studies for risk assessment is consistent with the approach of other states (e.g., Minnesota, New Jersey, and New York) and federal agencies (EPA and ATSDR). Due to differences in methodology, exposure history and data reporting, the existing human epidemiological studies alone were determined to be insufficient for deriving the dose for MCL/AGQS in a manner that would be consistent with other drinking water standards. Although a novel method for epidemiology-based risk assessment has been applied by a single European agency (European Food Safety Authority 2018), this approach is self-acknowledged to either overestimate or underestimate reference doses and has not been adopted by other U.S. regulatory bodies.

The critical health effects selected from the toxicology literature were non-cancer endpoints, including liver enlargement (PFOA and PFNA), delayed development (PFOS) and impaired reproduction (PFHxS). Recognizing that epidemiological studies have identified associations between certain PFAS and cancer, NHDES also considered the feasibility of deriving a MCL/AGQS for a cancer endpoint using its standard risk assessment approach. Of the four PFAS assessed by NHDES, only PFOA had a study for consideration of a cancer-based endpoint. However, this study (Butenhoff et al., 2012) had technical limitations that hinder extrapolation of serum doses, as well as uncertainty regarding the biological relevance to humans. Thus, it was determined that there was insufficient information to conduct an accurate risk assessment for a cancer endpoint given the existing scientific literature. This has similarly been studied by both EPA and ATSDR, and both determined that if a cancer endpoint would have been chosen, the resulting standard would have been at a higher (less protective) level and therefore, the endpoint chosen is fully protective for all health effects.

Due to the current lack of information on the toxicity of PFAS mixtures, NHDES conducted its risk assessment for each compound on an individual basis. There is emerging evidence that suggests various PFAS may affect similar organ systems, but these effects occur at differing doses depending on experimental design and their relative potency has not been quantified. To address this concern for mixture effects, other states have exercised a risk management strategy, instead of risk assessment, by applying a combined standard for the sum total of multiple PFAS. While perceived as protective, this risk management strategy lacks a scientific basis as the combined toxicity of multiple PFAS is poorly understood. As there is uncertainty about the specific health effects of PFAS and the growing number of different PFAS identified in the environment, the scientific and practical merits of any risk management approach should be carefully

evaluated as an alternative to standard risk assessment. NHDES continues to study developments in scientifically based approaches to regulating combinations of PFAS.

Consistent with the previous points, Michigan recently released a report summarizing the challenges for deriving health-based standards for PFAS under the current risk assessment paradigm. This report was prepared by an independent panel of scientists from government and academic institutions with technical expertise on PFAS health effects, exposure and remediation. Given the current limitations of animal studies and human epidemiology, the expert panel recommended developing regulatory approaches that consider both of these lines of scientific evidence. Yet they did not provide technical guidance on how that might be achieved. The panel also stated that the non-cancer endpoint of PFAS seem to be more sensitive than cancer endpoints and may be more important for setting regulatory limits. Furthermore, the panel emphasized caution in using combined regulatory approaches due to the lack of quantitative evidence for assuming similar potency of different PFAS. Additional discussion of these technical issues and their relation to the derivation of the proposed MCL/AGQS are detailed in Appendices 3-7.

Finally, it is important to note the toxicity values for the MCL/AGQS were derived from the lowest doses in animal studies that were determined to be relevant to human health. This included selection of health effects associated with developmental delays from *in utero* exposure (i.e. PFOS), or other effects that occur at lower doses than those that induce developmental defects in animals (i.e., liver toxicity for PFOA and PFNA, and impaired reproduction for PFHxS). To afford additional protection for chronic exposure, daily water intake was assumed to be that of the 95th percentile for lactating women, which is the highest water in-take rate for adults (i.e., for a 175 lb. person, this would equal about 4.4 liters of water consumed each day. By using this rate of water intake to calculate the MCLs, the levels are expected to be safe for pregnant mothers and their fetuses, lactating mothers and their infants, and all children, adolescents, and adults). This high intake rate was assumed "through life" as a protective measure.

3. Occurrence, Ability to Reliably Quantify and Ability to Treat

The statute concerning how the State develops MCLs was amended in 2018 to clarify that New Hampshire's process should align with the process followed by EPA and most of the few other states that set MCLs. This section addresses three of the criteria that the law now requires be considered in the development of an MCL. It is important to note that no additional resources were provided to NHDES to produce information on these considerations or for cost and benefit estimates. Accordingly, NHDES used available data and work done under other investigations/projects or by others to address these aspects of determining a MCL.

3.1 Occurrence in Drinking Water

In New Hampshire, two contaminated sites, one involving contamination of Portsmouth, New Hampshire's municipal water system wells at the Pease Tradeport and another involving contamination of wells used as a source of water for Merrimack Village District in Merrimack, New Hampshire, raised awareness of these compounds and led NHDES and others to perform state-wide sampling at public water systems and other suspected sites. Based on these data, PFOA, PFOS, PFHxS, and PFNA occur in drinking water, groundwater and surface water in New Hampshire in proximity to releases of these contaminants to the environment. The following table describes the results of analysis for these chemicals at 402 of the 1,880 sources of drinking water that supply non-transient public water systems in New Hampshire.

Table 2: PFAS Concentrations Detected in Sources of Drinking Water for Non-Transient Public Water Systems (data provided by NHDES Sampling or PWS voluntary sampling conducted March 2016 to December 2018)

	Number of PFAS Sources			
Concentration (ppt)	**PFHxS**	**PFNA**	**PFOS**	**PFOA**
Not Detected	357	390	336	253
Detected at less than 10 ppt	35	6	47	125
10-20 ppt	2	3	14	13
20-40 ppt	7	3	2	8
40-60 ppt	1	0	2	0
Greater than 60 ppt	0	0	1	3

3.2 Ability to Reliably Quantify in Drinking Water

The following excerpt from the Association of State Drinking Water Administrator's PFAS Lab Testing Primer (https://www.asdwa.org/wp-content/uploads/2018/10/ASDWA-PFAS-Lab-Testing-Primer-10-10-18-Final.pdf) describes the current status of the ability to reliably quantify PFAS, including the four subject compounds, in drinking water:

"Laboratory analytical methods with reporting limits (RL) of at least 2-4 nanograms per liter (ng/L) parts-per-trillion (ppt) should be utilized. Many commercial labs are achieving reporting limits of less than 1 ng/L ppt. Additional health studies are rapidly evolving and some states have determined that PFAS health advisory concentrations in drinking water should be based on the additive effect of PFAS compounds. Obtaining water quality results with low RL will improve the utility of the data in the event health guidance or standards are changed or that the state you are in develops health guidance or standards based on the additive effects of PFAS.

It is important to understand the difference between a reporting limit (RL) and a detection limit (DL). An RL or reporting detection limit is the limit of detection in which the concentration of a contaminant can be reliably quantified. In contrast, the DL or method DL is lower than the RL and is below the point of calibration such that results reported below the RL are unreliable and as such, must be qualified as estimated values by carrying a "J" or "E" (NELAP) qualifier/flag."

Typical PFAS Reporting Limits	
Method 537	Range from 2.9 to 14 ng/L
Isotope Dilution	Varies by lab and compound but can be: • Below 1 ng/L for some compounds and • Up to 3 ng/L for others

3.3 Ability to Treat Drinking Water

Based on published literature, PFOA, PFOS, PFNA and PFHxS can be removed from drinking water with varying success using a number of treatment options. The most common treatment for PFAS removal, both in the literature and in practice, including at wells in New Hampshire, is granulated activated carbon (GAC). Data from a variety of sites, including at full-scale and fully operational municipal wells, clearly demonstrate that compliance with the proposed MCLs can be achieved using GAC or other approaches such as combining GAC with resin.

4. Costs to Affected Parties

NHDES used available water quality data to estimate potential costs to affected parties of compliance with the MCLs/AGQSs. For certain types of waste and groundwater discharge sites, this involved determining the frequency of exceeding the proposed standards for the sites sampled and applying that to the universe of sites. For other types of sites for which there are limited data, a qualitative description of anticipated costs is provided. As noted previously, with existing resources and expertise, NHDES was unable to analyze costs in keeping with EPA and Office of Management and Budget guidance, which entails determining costs associated with a number of different potential standards and capturing marginal costs.

For affected parties such as public water systems, landfill and hazardous waste site owners, and groundwater discharge permittees, NHDES had sufficient sampling data to estimate a cost range associated with setting these standards. In the case of affected public water systems that have already made significant investment in meeting the current AGQS, these costs were not included as new costs resulting from setting the standards. In the case of waste and discharge sites, where only initial sampling has occurred, the costs of compliance with the existing and new standards are included. The assumptions and analysis used to derive costs is included as an appendix to this report.

4.1 Estimated Costs to Public Water Systems to Comply with New MCLs

The MCLs for PFOA, PFOS, PFNA and PFHxS will apply to PWSs that serve residential populations (community PWSs) and those that serve the same 25 or more people each day for at least 6 months of the year (non-transient, non-community PWSs), such as schools and places of work with their own wells. There are currently 1,880 sources of water for PWSs that would be subject to the adoption of these MCLs. The costs incurred by these PWSs include the cost of routine sampling, the frequency of which will depend on compliance with the MCLs. For public water systems that exceed any of the MCLs based on a running annual average, the costs will also include treatment such as GAC, and operation and maintenance costs associated with the installed treatment. The methodology and assumptions made for estimating each of these costs is contained in Appendix 9. To summarize, NHDES estimated the following:

The initial cost of sampling for PWSs is estimated to be $1,102,500 - $2,836,000. Based on the anticipated percentage of detections, the costs of sampling for non-transient PWSs in year 2 thru 9 after the MCLs are established are estimated to be $73,055 - $184,825.

To date, sampling has occurred at 402 of the 1,880 sources of non-transient public drinking water in New Hampshire (see Table 2 in the Occurrence in Drinking Water subsection). Comparing these analytical results to the proposed standards allows estimation of the number of public water systems that will require treatment. The cost of treatment at PWSs associated with these standards is estimated to range from $1,800,000 - $5,200,000.

NHDES utilized operation and maintenance estimates from PWSs that have developed cost estimates for maintaining PFAS treatment systems under construction to comply with the current PFOA and PFOS 70 ppt combined AGQS to estimate operation and maintenance costs associated with the new MCLs. Operation and maintenance costs are estimated to range from $114,912 - $223,439 per year.

New Hampshire does not require drinking water not supplying public water systems to comply with MCLs. However, it is anticipate that homeowners and others with private wells will incur costs to ensure

their drinking water meets health based standards. NHDES estimates that 3,125 of the 250,000 private wells in New Hampshire will have drinking water that exceeds the MCLs. The cost of point-of-entry treatment for those wells is estimated to be $9,375,000, with an annual maintenance cost of $2,812,500.

4.2 Estimated Costs to Comply with New and Existing AGQS

4.2.1 Municipal Solid Waste Facilities (Groundwater Management/Release Detection Permits)

The vast majority of the unlined/lined solid waste disposal facilities or synthetic lined waste water treatment lagoons in New Hampshire are municipally owned, and as such, the municipality is responsible for maintaining the water quality systems and monitoring water quality associated with a permit. There are roughly 200 of these facilities that currently have groundwater release detection or groundwater management permits that have been issued by NHDES, in accordance with its administrative rules. These permits prescribe programs for periodic groundwater quality monitoring and reporting, provide for groundwater remediation either through active measures or natural attenuation, specify performance standards for remedies, and describe procedures for performing site investigations and implementing remedial action plans.

NHDES has required sampling for PFAS at all of these sites. To date, 58% have sampled and approximately 42% of those have exceedances of the current AGQS for PFOA and/or PFOS. Based on the proposed MCLs, 44% are estimated to have exceedances. NHDES has assumed that 25% to 50% of these sites will require either an expansion of the existing groundwater management zone where PFAS is already an established contaminant of concern (COC) or will require investigation where PFAS will become a new COC. The capital costs are estimated to be in the range of $380,000 - $755,000, and the annual operating costs could range from $260,000 - $390,000 per year. This includes assumptions concerning the cost to install additional monitoring wells, comply with permit sampling and reporting requirements, sample private wells and provide treatment to some percentage of the private wells tested, and administration of the permits. The worksheet that includes the assumptions and unit costs is provided in Appendix 10.

4.2.2 Hazardous Waste Remediation Sites (Groundwater Management Permits)

Hazardous waste remediation sites include all sites where a hazardous substance or waste has been released, and often have a long-term remediation and management component prescribed and regulated through an NHDES-issued groundwater management permit or remedial action plan. There are roughly 515 waste sites, including State-listed hazardous waste, CERCLA, and brownfields sites, that have an open status and are currently regulated by NHDES.

NHDES has required waste sites that meet certain criteria to complete an initial screening for the presence of PFAS. To date, 27% have sampled and approximately 49% of those have exceedances of the current AGQS for PFOA and/or PFOS. Based on the proposed MCLs, 53% are estimated to have an exceedance. NHDES has assumed that 25% to 50% of these sites will require either an expansion of the existing groundwater management zone where PFAS is already an established COC or will require investigation where PFAS will become a new COC. Assuming these percentages of non-compliance for the universe of waste sites, with the exceptions noted below, the capital costs are estimated to be in the range of $1,150,000 - $2,310,000 and the annual operating costs could range from $570,000 - $1,020,000 per year. Not included in the estimate above are costs associated with a few unprecedented, large-scale site investigations and associated response actions currently ongoing in southern New Hampshire to mitigate PFAS-contaminated drinking water. Response

actions at these sites have included providing treatment or alternative water sources to affected properties. Based on site-specific data collected to date, it is estimated that the proposed MCLs will result in an expanded area requiring investigation and additional properties requiring sampling and treatment. The additional capital costs unique to these southern New Hampshire sites are estimated to be in the range of $1.52M - $2.53M and the additional annual operating costs could range from $220,000 - $365,000 per year.

The cost estimates for waste sites include assumptions concerning the cost to install additional monitoring wells, comply with permit sampling and reporting requirements, sample private wells and provide treatment to some percentage of the private wells tested, and administration of the permits. The worksheet that includes the assumptions and unit costs is provided in Appendix 10.

4.2.3 Oil Remediation Sites (Groundwater Management Permits)
Oil remediation sites include all sites where long-term remediation and management of petroleum contamination occurs primarily through a NHDES-issued groundwater management permit or remedial action plan. There are approximately 1,500 active petroleum sites, including, but not limited to, leaking underground/above ground storage tank sites, and spill sites that have an open status and are currently regulated by NHDES.

NHDES has recently undertaken an initiative requesting a small initial subset of these petroleum sites to voluntarily complete an initial screening for the presence of PFAS. To date, only an estimated 1% of all petroleum sites have sampled for PFAS. The data indicate that some percentage of sites will have exceedances of the proposed MCLs. However, based on the limited nature of information and the types of releases/release mechanisms associated with petroleum sites, the capital and annual costs associated with the proposed MCLs is indeterminate at this time.

4.2.4 Wastewater Disposal to Groundwater (Groundwater Discharge Permits)
A number of municipalities and some private entities dispose of wastewater to the ground through such practices as discharges to lagoons, rapid infiltration basins, spray irrigation systems and very large leach fields. There are 96 of these facilities that currently have a groundwater discharge permit, which allows the discharge in accordance with rules that protect against impact to other properties and wells. NHDES has required sampling for these and other PFAS at all of these sites. To date, 44% have sampled and, of those, 29% have exceeded one or more of the proposed MCLs. Assuming this same percentage of non-compliance for the universe of sites, the capital costs are estimated to be approximately $1,100,000 and the annual operating costs are estimated in the range of $200,000 - $400,000. This includes assumptions concerning the cost to install additional monitoring wells at these sites, sample private wells and provide treatment to some percentage of the private wells tested. Given the variety of groundwater discharge sites and that wastewater discharge volumes at many permitted facilities are on the order of hundreds of thousands of gallons per day, available treatment technologies would not suitably treat these flows in a manner that is cost effective. The worksheet that includes the assumptions and unit costs is provided in Appendix 11.

4.2.5 Biosolids and Sludge Processing and Application Sites and Septage Land Spreading.
Biosolids are produced by municipally owned wastewater treatment facilities when they receive a sludge quality certification from NHDES approving the material for beneficial use as a fertilizer in New Hampshire. Some industrial sludge, such as short paper fiber or water treatment residuals, may also be approved for land application for their organic content or ability to bind phosphorous,

respectively. Before biosolids or sludge can be applied to the land for agricultural purposes, they must receive a Sludge Quality Certification that ensures that over 159 potential contaminants are at acceptable levels, following strict screening guidelines that protect groundwater and human contact. Until a leaching standard (the amount that can be in the biosolid or sludge without its land application resulting in an exceedance of AGQS) is set for these four PFAS, it is impossible to quantify the costs resulting from establishing these standards. In some cases, biosolids and sludge that are now being applied for beneficial purposes (i.e., fertilizer or organic material) may no longer be able to be used and communities and industry may see a rise in their biosolid and sludge disposal costs. A similar cost increase could occur at the five domestic septage (i.e., material pumped from residential septic tanks) land spreading sites if PFOA, PFOS, PHNA, PFHxS are found to leach into groundwater at unacceptable levels (i.e., causes an exceedance of AGQSs set for the four PFAS).

At the present time, New Hampshire has only one biosolids processing site that must sample and comply with the four PFAS AGQSs that are established as a result of setting the MCLs. This facility is currently sampling for PFAS, specifically to comply with the existing combined standard for PFOA and PFOS of 70ppt. The new AGQSs may require the installation of new sampling wells and modification of the facility to protect groundwater by controlling and treating runoff, etc. These costs are unknown at this time. This facility primarily serves municipalities and any increase in costs is likely to be reflected in increased tipping fees paid for by the New Hampshire municipalities who utilize this facility.

4.2.6 Fire Station/Fire Foam Sites

A known source of PFAS in the environment is the use of certain formulations of firefighting foams, referred to as Class B foam or aqueous film-forming foam (AFFF), which contains PFAS. Certain fire training areas and discrete locations across the state where AFFF has been applied historically are currently undergoing remedial investigation and/or cleanup of PFAS-contaminated groundwater. The recent discovery of contamination in drinking water wells at fire stations has prompted additional sampling in the vicinity of those fire departments, and has resulted in the detection of elevated PFAS concentrations in nearby private and public drinking water supply wells. Of the 16 fire departments that have sampled their private water supply wells and provided results to NHDES, five (or 31%) would exceed the proposed MCLs.

Based on review of available information, there are an estimated 293 fire stations in New Hampshire of which potentially just over 175 may be serviced by a private water supply well. Furthermore, information suggests that there are over 120 active public water supplies and potentially over 4,600 private wells within 1000 feet of a known fire station. Given the limited information, the capital and annual costs associated with the existing AGQS and the proposed MCLs is indeterminate at this time.

4.2.7 Air Deposition Sites

In addition to instructing NHDES to set MCLs, which in turn become AGQSs, for PFOA, PFOS, PFNA, PFHxS, SB 309 also require the agency to limit air emissions from facilities that cause or contribute to an exceedance of an AGQS and otherwise address the contamination caused. It is not possible to determine the number of facilities that have emissions that cause or contribute to contamination above the AGQS(s) or the costs associated with treatment, investigation and remediation.

NHDES has identified one current and one former industrial facility that have emissions that resulted in the exceedance of the current AGQS for PFOA and PFOS and is evaluating Best Available Control

Technology for PFAS emissions for the current facility. Estimated capital costs for the control devices under consideration range from $2,000,000 - $3,000,000 with annual operating costs of $200,000 - $400,000. In addition, the facility would be subject to air emission stack testing that could cost approximately $100,000 per test, depending on testing methodologies employed. Other potentially affected parties include:

1. Facilities with evaporators used to reduce the volume of liquid wastes if the liquid contains PFAS compounds.

2. Landfill gas (LFG) emissions at solid waste landfills, if it is determined that LFG contains PFAS. Further study as to the effectiveness of combustion of LFG in boilers, engines, turbines or flares as well as current treatment occurring at some LFG to energy facilities would be necessary to identify the impact from this potential source.

3. Other industrial facilities identified as using PFAS where emissions to air might be of concern. Specifically, this could be chrome plating operations that historically used PFAS mist suppressants.

4.2.8 Miscellaneous Sources

Highly fluorinated chemicals can be found in commercially available products and that are used in households, institutions and commercial and industrial facilities. Examples of items that *may* contain PFAS include but are not limited to:

1) Paints.
2) Sealants, including products used on grout, countertops and floor treatments.
3) House cleaners and stain removers.
4) Floor wax removers.
5) Stain-resistant textiles (or chemicals used to treat textiles in homes and businesses) including, but not limited to, carpets, shoes and clothing.
6) Furniture with stain-resistant fabric.
7) Water proof textiles.
8) Food cooking ware and utensils.
9) Ski and boat waxes.
10) Dental floss, cosmetics, sunscreen and other personal care products.
11) Construction materials, including caulk sealants and plumbing sealants.
12) Pesticides.
13) Treated paper.
14) Chemical coatings for metal roofing.
15) Solar panels.
16) Purchased garden soils.
17) Automotive supplies, including waxes, cleaners, windshield wipers and additives to fluids used in automobiles.
18) Camping and other outdoor gear.
19) Spray- and grease-based lubricants.
20) Inks.

The possible presence of PFAS in these items not only presents other exposure potential for PFAS to individuals in the home and at businesses, but also another potential source of contamination to

wastewater, groundwater, storm water and/or surface water. NHDES lacks sufficient data to estimate the potential costs to facility owners of addressing contaminated sites that result from the use of these products.

5. Benefits to Affected Parties

In general, it is difficult to quantify the monetized benefits for environmental and public health standards, and often the case is made that EPA's guidance on deriving benefits for MCLs underestimates benefit, particularly in the area of indirect costs such as reduced quality of life for both the sick individual and their family caregivers. *Contingent valuation,* which is a survey-based economic method for valuing non-market resources (e.g., asking people what they would pay to lower the risk of an adverse health outcome) is a widely accepted economic method to evaluate benefits in such cases as establishing a MCL when reduction in risk can be reasonably quantified. Contingent valuation is based on the economic principle that value equates to willingness to pay. Unfortunately, the type of information needed to use contingent valuation is not yet available for PFAS. While PFOA, PFOS, PFHxS and PFNA have clearly been associated with numerous adverse health outcomes in animals, the mechanism for, and risks related to, similar outcomes in humans are not well understood. Accordingly, NHDES currently has no quantified value of benefit, although there is likely significant benefit to reducing exposure to these compounds through drinking water given the findings of the few previous direct exposure studies and the emerging findings from current epidemiological studies. Qualitatively, given the potential for direct health care treatments costs, associated losses of economic production and income of those impacted, and associated impacts to families and caregivers, limiting exposure to PFOA, PFOS, PFNA and PFHxS at unsafe levels may result in numerous and significant avoided costs.

NHDES researched the subject of benefit quantification and spoke with experts, including a group of professors and researchers at the University of New Hampshire (UNH), with whom NHDES recently contracted to quantify the benefits of reducing the arsenic MCL. NHDES intends to further evaluate the possibility of quantifying benefit of these standards with the group at UNH to see whether studies exist or emerge that would allow the department to do so. In addition, through previous stakeholder engagements, a number of stakeholder groups have been engaging with other research institutions throughout the United States to find recent methods or studies that can help quantify the benefits.

APPENDICES

Appendix 9: Analysis of Increased Costs for PWS to comply with Proposed MCLs for PFOA, PFOS, PFNA, PFHxS

Appendix 9: Cost of Compliance with Proposed MCL for PFOA, PFOS, PFNA & PFOA/PFOS Combined for PWS and Private Wells

1.0 PFAS Treatment Costs

Costs to operate and maintain treatment systems to remove PFAS has been prepared assuming treatment is required when

a. PFOS & PFOA combined exceeds 70 parts-per-trillion (ppt);
b. PFOA exceeds 38 ppt;
c. PFNA exceeds 23 ppt; or
d. PFHXS exceeds 85 ppt.

1.1 Occurrence Information

The PFAS sampling results for non-transient PWS were reviewed. Four hundred and two sources of water associated with non-transient PWS were sampled. Two sources of water (0.5% of the sources sampled) equaled or exceeded 70 ppt for PFOA and PFOS combined. Three sources of water (0.75% of the sources sampled) equaled or exceeded 38 ppt for PFOA. Three sources of water exceeded 23 ppt for PFNA, however two of these three sources of water already exceeded the standard for PFOA and PFOA and PFOS combined. None of the results exceeded 85 ppt for PFHxS. Non-transient PWS sources around the Saint Gobain site and the Haven well at Pease Tradeport are not included in the occurrence analysis above, as there are likely not any sources of public drinking water near the type of large scale contamination sources that impacted these wells.

1.2 Costs for Water Treatment for Water Sources Associated with Non-transient PWS With Sampling Results

All sources for PWS that exceed 38 ppt for PFOA and/or 70 ppt for PFOA and PFOS combined already exceed the existing 70 ppt AGQS for PFOA and PFOS combined and costs are already being incurred by these water systems to comply the current AGQS. Therefore, the proposed values of 38 ppt for PFOA and 70 ppt for PFOS and PFOA combined do not require the expenditure of additional funds.

1.3 Costs for Water Treatment for Water Sources Associated with Non-transient Public Water Systems Without Sampling Results

In order to estimate the volume of water that may require treatment for non-transient public water systems that were not sampled, the daily flow volumes for these systems were estimated based on the volume of flow associated with the wellhead protection area for each unsampled source. Generally, this flow volume is the maximum volume that would be used from a particular source.

The cost per gallon to treat water for PFAS can vary broadly. Issues such as the potential for the need to construct a new building, volume of flow, initial PFAS concentrations or pretreatment requirements for constituents such as iron, manganese and radon can cause costs to vary by up to 300% from source to source. The costs per unit of flow used in the estimate were based on the costs associated with treatment at sites in New Hampshire and New York. These are summarized below. The lowest cost per gallon ($2.91 for MVD 4 & 5) and the highest cost per gallons ($8.10 for Pease) were used to develop high and low end estimates.

PFAS Treatment Costs Associated with PWS in New Hampshire and New York:

	Gallons Per Day	Cost	Cost Per Gallon
MVD 4/5	1,152,000	$3,350,000	$2.90
MVD 7/8	1,800,000	$8,000,000	$4.44
Pease	1,728,000	$14,000,000	$8.10
Hooksick Falls	500,000	$3,000,000	$6
Marlow School	1,125	$4,000	$3.56

The treatment costs for sources of water associated with non-transient PWS were estimated. The production volumes associated with the wellhead protection area for the unsampled sources were summed and multiplied by the 0.5% to estimate treated costs associated with sources of water that may exceed 70 ppt PFOA and PFOS combined. Similarly, the production volumes were summed and multiplied by 0.75% to estimate the treatment costs for sources that may exceed 38 ppt for PFOA.

The spreadsheet used to complete the calculations is attached.

The total cost estimates are below:

	Low Estimate	High Estimate
PWS with Sampling Results	$0	$0
Unsampled Public Water Systems	$1,851,354	$5,171,022
Total Cost	$1,851,354	$5,171,022

1.4 Operation and Maintenance Costs for PFAS Water Treatment Systems for Public Water Systems

The operation and maintenance (O&M) cost estimates for PWS were developed using estimated O&M costs associated with the treatment system being constructed for Merrimack Village District's wells 4/5 and the estimated O&M costs associated with the treatment system being constructed at Pease. The estimated annual O&M cost based on the average daily volume that is anticipated to require treatment is $0.18 per gallon to $0.35 per gallon

The annual O&M costs are estimated to be *$114,912 - $223,439* per year.

The cost estimates do not include O&M costs for non-transient public water systems that currently exceed the current AGQS of 70 ppt for PFOA and PFOS combined.

1.5 Chemical Monitoring Costs

Upon the adoption of the proposed MCLs, all non-transient public water systems will be required to sample all sources of their water for four consecutive quarters. After the first year of initial sampling, the average concentration of PFOA, PFOS, PFNA and PFHxS will be calculated for each water source to determine compliance with the MCLs. After the first year of sampling, the frequency of future sampling will be dictated by the results of the first year of sampling. The tables below estimate the cost associated with testing all sources of water on a quarterly basis for the first year and estimated ongoing sampling costs after the first year of sampling.

Assuming Sample Analysis cost of $175 - $450 per sample
1st Year Laboratory Costs - Quarterly Compliance Sampling

Owner	# PWS	# Sites	Initial Cost
State	6	13	$9100 - $23,400
Federal	3	4	$2800 - $7200
Local	274	472	$330,400 - $849,600
Others	907	1086	$760,200 - $1,955,800
TOTAL	1190	1575	$1,102,500 - $2,836,000

Projected Percentage of PWS Sample Sites at Various Contaminant Levels

% of MCL	PFHXS	PFNA	PFOA	PFOS	PFOA + PFOS
ND	86.4%	92.8%	50.3%	79.7%	
<20%	11.4%	3.0%	37.1%	16.4%	38.3%
20 to 75%	2.2%	2.5%	10.7%	3.2%	8.9%
>75% to MCL	0%	1.0%	1.2%	0.5%	1.2%
>=100%	0%	0.7%	0.7%	0.2%	0.5%

Projected Annual Compliance Monitoring Laboratory Costs (years 2 - 9)

Contaminant Range	% of Sites	# of Sites	Sampling Frequency	Cost/Site/Year	Total Sampling Cost/Year
>MCL or Treatment	2%	32	Quarterly	$700 - $1800	$22,400 - $57,600
>75% to MCL	3%	47	Annually	$175 - $450	$8225 - $21,150
20 to 75%	15%	236	Every 3 Years	$60 - $150	$14,160 - $35,400
<20%	19.5%	307	Every 6 Years	$30 - $75	$9210 - $23,025
ND**	60.5%	953	Every 9 Years	$20 - $50	$19,060 - $47,650
				Average Annual Cost	$73,055 - $184,825

**Most sites that have any detection will exceed the threshold value for more than one contaminant. Preliminary study shows 243 out of 402 sites tested as having no detections (60.5%).

1.6 Other Potential Costs that Could Impact Public Water Systems

In southern New Hampshire, several square miles of soil have been contaminated with PFAS due to air emissions. Water utilities completing construction projects in these areas may incur increased costs associated with managing potentially contaminated soils and construction dewatering in these areas.

2.0 Cost Estimates for Private Wells

It is estimated that there are 250,000 private wells in New Hampshire. If it is assumed 0.75% of the private wells in the state will require treatment for PFOA exceeding 38 ppt and 0.5% of the private wells will require treatment for PFOA and PFOS exceeding 70 ppt, the treatment costs will be approximately *$9,375,000 for 3125 private wells*. This assumes there are 250,000 private wells and it will cost $3000 per well to install treatment. [(0.75% x 250,000 wells + 0.5% x 250,000 wells) x $3000/well]

It is estimated that it will cost $900 per year per well to sample and test and maintain treatment systems for PFOS and PFOA. *The total cost annual cost to test and maintain treatment systems for 3125 private wells is estimated to be $2,812,500*.

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

Rules Related to Per- and Polyfluoroalkyl Substances (PFAS):
FP 2019-14, Env-Wq 402 amendments
FP 2019-15, Env-Or 603.03 amendments
FP 2019-16, Env-Dw 700-800 amendments

Summary of Comments on Initial Proposals with NHDES Responses
June 28, 2019

Three sets of proposed rules and rule amendments relate to four per- and polyfluoroalkyl substances (PFAS), specifically perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluorooctane sulfonic acid (PFOS), and perfluorooctanoic acid (PFOA). The three sets of rules are as follows:

Env-Dw 700 & 800 (FP 2019-16) establishes maximum contaminant levels (MCLs, the drinking water standards with which public water systems must comply) for the four PFAS in public drinking water and adds monitoring, compliance, reporting, and public notice requirements for the four PFAS;

Env-Or 603.03 (FP 2019-15) establishes ambient groundwater quality standards (AGQS), for the four PFAS, that are required by statute to be equivalent to the MCLs established in Env-Wq 700; and

Env-Wq 402 (FP 2019-14) establishes water quality standards and procedures for discharges to groundwater of wastewater containing any of the four PFAS.

The purpose of this document is to summarize the comments NHDES received from the public on all three proposed rules and to identify the changes made to the proposed rules in response to the comments or explain the reason(s) why NHDES did not make changes. Comments received that were unrelated to the proposed rules are not addressed in this document. To provide a foundation for the comments and responses, brief explanations of the purpose of the rules and of the rulemaking process are provided, as well as a summary of the main provisions of the rules and an explanation of how the currently proposed MCLs/AGQS were derived. A list of commenters on the rules and all written comments received concerning the rules as well as the transcripts for the three public hearings can be found on the NHDES website by searching on "PFAS".

OLS also provided written comments, which have been addressed.

Purpose of Proposed Rules

Env-Dw 700 & 800 establishes MCLs and monitoring, compliance, reporting and public notice requirements for the four health-related regulated PFAS ("health-regulated PFAS") that will apply to all non-transient public water systems, as required by RSA 485:16-e. The final proposed MCLs and AGQSs are:

Contaminant	Final Proposed MCL/AGQS (Part Per Trillion (ppt))
PFHxS	18 ppt
PFNA	11 ppt
PFOS	15 ppt
PFOA	12 ppt

The rules also eliminate the requirement for the owner or operator (O/O) of a laboratory that is seeking approval for an alternate analysis method to identify the specific PWS for which the alternate method would be used, meaning that once an alternate method is approved, it could be used for any PWS.

Env-Or 603.03 is being amended to change the existing AGQS for PFOA and PFOS and to add AGQS for PFNA and PFHxS. As required by RSA 485-C:6, those AGQS are identical to the MCLs that are proposed to be established under Env-Dw 700.

Env-Wq 402 is being amended to establish requirements for discharges to groundwater of wastewater containing any of the four PFAS. Those requirements reflect the proposed changes to the AGQS that would be established under Env-Or 603.03 and are intended to accommodate the lack of available technology to treat large quantities of wastewater that is contaminated with certain PFAS. Specifically, the rules would:

(1) Include residual PFOA, PFOS, PFNA, and PFHxS in the existing conditional exemption for meeting AGQS under certain circumstances;

(2) Establish a discharge limit for PFOA, PFOS, PFNA, and PFHxS in wastewater discharged to groundwater;

(3) Account for exceedances of the applicable limits for PFOA, PFOS, PFNA, and PFHxS; and

(4) Include PFOA, PFOS, PFNA, and PFHxS in the treatment/alternative response requirements established for 1,4-dioxane which includes identifying and eliminating contributing discharges to the wastewater stream.

Summary of Rule Development Process

Laws of 2018, Ch. 345 directed NHDES to initiate rulemaking related to PFOA, PFOS, PFHxS and PFNA by January 1, 2019, to:

(1) Establish MCLs for PFOA, PFOS, PFNA and PFHxS; and

(2) Re-evaluate the current AGQSs for PFOA and PFOS, which currently is 70 ppt combined, and to establish AGQSs for PFHxS and PFNA. AGQSs are clean-up standards for contaminated sites. Existing law (RSA 485-C:6) has always required an AGQS to be the same as any established MCL for a contaminant. The AGQS are also used to determine appropriate discharge limits for groundwater discharge permits.

The law provided funding for a toxicologist and health risk assessor position, which were filled in October of 2018. Also in October, NHDES held three technical sessions -- in Concord, Merrimack and Portsmouth (Pease Tradeport) -- to provide stakeholders with the opportunity to submit or identify studies and research pertinent to deriving health based standards and addressing other considerations required by law, including occurrence, ability to detect and treat as well as the anticipated costs and benefits. After careful review of appropriate studies and other states' approaches, NHDES began rulemaking by filing a Request for Fiscal Impact Statement with the Legislative Budget Assistant (*see* RSA 541-A:5) on December 31, 2018.

The initial proposal included the following levels for MCLs and AGQSs:

Contaminant	**Initial Proposed MCL/AGQS** (Part Per Trillion (ppt))
PFHxS	85 ppt
PFNA	23 ppt
PFOS	70 ppt
PFOA	38 ppt
PFOA & PFOS Combined	70 ppt

In conjunction with initiating the rulemaking, NHDES issued the "Summary Report on the New Hampshire Department of Environmental Services Development of Maximum Contaminant Levels and Ambient Groundwater Quality Standards for Perfluorooctane sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorononanoic Acid (PFNA), and Perfluorohexane sulfonic Acid (PFHxS)" on January 4, 2019 ("January 2019 Report").

After filing the initial proposed rules and rulemaking notices, NHDES held public meetings in Merrimack and Portsmouth (Pease Tradeport) to explain how the proposed standards were derived. The public hearings on the

proposed rules required by RSA 541-A were held in early March 2019 in Merrimack, Portsmouth and Concord. In addition to soliciting comments on the initial proposal, participants were asked to comment on the use of a toxicokinetic model developed by the Minnesota Department of Health ("MN model") to assess blood serum levels of people exposed to PFOA, including breastfed and bottle-fed infants. In the press release announcing the public hearings, NHDES informed interested parties that a preliminary assessment indicated that using the model would likely lower the proposed standards.

The final proposed rules reflect further research and new studies, the use of the MN model, consideration of comments received, discussions with other state and academic toxicologists, and professional judgement on what health-based standards will be sufficiently protective of human health over all life stages. While NHDES is unable to quantify all the costs and benefits associated with these proposed rules due to the emerging nature of these contaminants and the science related to them, after considering what currently is known about costs and benefits NHDES believes that the benefit of adopting these rules is not outweighed by the costs of implementing the proposed health based standards.

Summary of Significant Differences Between Initial and Final Rulemaking Proposals

1. The proposed MCLs/AGQSs have been lowered, primarily due to using the MN model.

2. The term "per- and polyfluoroalkyl substances (PFAS)" has replaced the term "perfluorinated compounds (PFCs)" throughout the document. PFAS is the more inclusive term and was used in most of the comments received, even though the rules currently do not include any polyfluorinated compounds.

3. The implementation requirements for public water systems have changed to reduce initial sampling frequency to two quarters if both samples come back with non-detects and to limit the maximum time between performing sampling to three years.

Technical Explanation of Proposed Lower MCLs/AGQSs and Updated Costs and Benefit Information:

Attachment 1 is "New Hampshire Department of Environmental Services Technical Background for the June 2019 Proposed Maximum Contaminant Levels (MCLs) and Ambient Groundwater Quality Standards (AGQSs) for Perfluorooctane sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorononanoic Acid (PFNA), and Perfluorohexane sulfonic Acid (PFHxS)" dated June 28, 2019 ("June 2019 Report"). It also includes findings of a peer review of NHDES's derivations conducted by Stephen M. Roberts, Ph.D.

Attachment 2 is an update on cost and benefit considerations.

Comments and Responses

General and technical comments concerning this rulemaking are categorized and listed below. Note that in addition to revisions discussed below, revisions have been made to each of the rules put the four compounds in alphabetical order.

General Comments Related to Proposed MCLs/AGQSs

Comments: The proposed MCLs and AGQS should be lower. A number of comments suggested the standards should be at 1 ppt combined. Others suggested that NHDES should adopt the lower advisory numbers adopted by other states or, in the case of New Jersey, its MCL for PFNA.

The proposed MCLs and AGQS should be higher. A few comments were received that urged NHDES to look at recently established health advisories in Canada and elsewhere that would increase the standards initially proposed.

Response: NHDES considered all of these comments and carefully reviewed all existing advisories and standards set elsewhere. However, the process used by NHDES incorporates long-established methodologies for setting standards that use the most current, defensible science and incorporates expert professional judgements. The resulting proposed standards are protective of human health at all life stages. Specific criticisms of factors used in the derivation of the standards are in the technical comments table.

ATTACHMENT 2

New Hampshire Department of Environmental Services

Update on Cost and Benefit Consideration

June 28, 2019

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

UPDATE ON CONSIDERATION OF THE COSTS AND BENEFITS RELATED TO FINAL PROPOSED MAXIMUM CONTAMINANT LEVELS AND AMBIENT GROUNWATER QUALITY STANDARDS FOR PERFLUOROOCTANESULFONIC ACID (PFOS), PERFLUOROOCTANOIC ACID (PFOA), PERFLUORONONANOIC ACID (PFNA), AND PERFLUOROHEXANESULFONIC ACID (PFHXS)

6/28/2019

Chapter Law RSA 345 requires the New Hampshire Department of Environmental Services to consider what is known about cost and benefit to affected parties when proposing maximum contaminant levels (MCLs) and ambient groundwater quality standards (AGQSs). This consideration was documented in the "Summary Report on the New Hampshire Department of Environmental Services Development of Maximum Contaminant Levels and Ambient Groundwater Quality Standards for Perfluorooctanesulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorononanoic Acid (PFNA), and Perfluorohexanesulfonic Acid (PFHxS)", dated January 4, 2019 (January 2019 report), for the initial proposed rules and is updated here for the final proposal. As was the case for the initial proposal, the emerging nature of PFAS contamination limits the availability of certain information that would be needed for a complete quantification of all the costs and benefits that will result from adopting these rules. Examples of these limitations include not having extensive sampling data for all potential contamination sources and public water systems statewide and having an incomplete understanding of all the health impacts associated with exposure to these four PFAS. Since the initial proposal, NHDES has continued to gather information and further research what is known about costs and benefits to consider in determining the standards to be included in the final proposal. Consideration of the updated information was performed and due to the clear, although difficult to quantify, health benefits in limiting exposure, the department chose to not alter the health based standards, despite recognizing the significant implementation costs.

Additional information on costs and benefits considered is provided below:

BENEFITS:

In the case of benefits, a number of new studies continue to suggest significant health impacts related to these four compounds, confirming that PFAS may:

- Increase cholesterol levels
- Increase liver enzyme levels
- Affect growth, learning, and behavior
- Interfere with the body's natural hormones, including thyroid hormone levels and sex hormone levels that could affect reproductive development and a woman's fertility
- Affect the immune system (e.g., decrease how well the body responds to vaccines)
- Increase the risk of certain types of cancers

These same health risks are identified by the Agency for Toxic Substances and Disease Registry (ATSDR) an agency within the Centers for Disease Control (CDC). https://www.atsdr.cdc.gov/pfas/health-effects.html

Additionally, the recent publication "A transgenerational toxicokinetic model and its use in derivation of Minnesota PFOA water guidance" provides a peer reviewed method to estimate blood serum levels that result from exposure to PFOA (later papers and one currently under peer review documented similar capabilities for PFOS, PFNA and PFHxS) in infants and children. As the statute specifically required that proposed standards provide "*an adequate margin of safety to protect human health at all life stages, including but not limited to pre-natal development*", this insight into how developmental-stage blood serum levels respond to different amounts of each of the four PFAS in drinking water strongly suggests that the proposed lower MCLs/AGQSs are necessary to keep infant and children blood serum levels below the levels that indicate enhanced risk of the various health endpoints identified by the ATSDR above.

As was described in the January 2019 report, NHDES was not able to monetize the avoided health impact costs. However, some of these impacts are clearly associated with the developmental stage of life and therefore can have significant through-life costs such as direct health care treatment costs, the associated losses of economic production and income of those impacted, and the associated impacts to families and caregivers. NHDES came to this conclusion after reviewing the most recent published research and speaking with experts, including a group of professors and researchers at the University of New Hampshire (UNH) with whom NHDES recently contracted to quantify the benefits of reducing the arsenic MCL. After filing the initial proposal, NHDES continued to reach out to experts and search for valid methods for quantifying benefit. Two recent studies were identified that have attempted to quantify benefits. The utility of both these studies is discussed below. The lack of science identifying direct causality between health impacts and these compounds continues to limit quantification of benefit, as was discussed in the January 2019 report related to utilizing contingent valuation studies. It should be noted that this is not unique to PFAS regulation in other states, other compounds have been regulated once the linkage to negative health impacts was documented, but before direct causality and dose/rate relationships were clearly known. This precautionary process is followed in drinking water regulation to limit the harm identified while the exact benefit is quantified through longer term studies. NHDES, based on the most recent studies, is confident that there is a clear and significant benefit to reducing exposure to these compounds through drinking water while additional studies will help to more accurately quantify the specific health care costs avoided from the known, and to be discovered, specific health impacts caused by these four PFAS compounds.

A new study produced by the Nordic Council of Ministers "The Cost of Inaction, A socioeconomic analysis of environmental and health impacts linked to exposure to PFAS" has attempted to quantify costs associated with low, medium and high risks of exposure to PFAS. This report assumes that PFAS as a group directly causes certain associated health impacts and then assumes a percentage of reported health events, for instance for kidney cancer, is caused by exposure to PFAS above certain levels. While not directly of utility to quantifying the health benefit associated with the proposed standards for these four compounds in New Hampshire, it does provide further estimation of the avoided costs that could be associated with reduced exposure to PFAS. A summary of the report is attached.

Similarly, a recent study used a previous study, that showed a clear link between low to moderate exposure to PFOA and reduced birth weights, to estimate health impact costs. This study, "Perfluorooctanoic acid and low birth weight: Estimates of US attributable burden and economic costs from 2003 through 2014", showed that while blood serum levels in the general US population are going down, there are still impacts to birth weights and attempted to quantify the through-life cost impacts of

those reduced birth weights. This is based on the National Health and Nutrition Examination Survey (NHANES) database where the general population is measured on a number of factors, including PFAS blood serum levels. It is important to note that a number of New Hampshire communities have measured blood serum levels significantly above those found in the NHANES data, which implies there is significant benefit in reducing exposures to better align with the national averages, as this study indicates there are still health impacts (reduced birth weight) that could be reduced by limiting exposure prior to and during pregnancy. While this study cannot be directly related to NH's population to quantify a benefit due to health cost mitigation, it did calculate (for the entire United States population) that the health impacts due to reduced birth weight were $347 million in 2013-2014. It is a consideration that the national averages for PFOA blood serum levels during this time period were half what has been measured recently in some impacted NH communities. The cost implications estimated in the study when the US population had similar blood serum levels to NH's impacted communities was approximately $2.7B. While this does not quantify the benefits of reduced PFAS exposure, it does imply that the benefits are significant.

Finally, the treatment that will be used at most public water systems that exceed an MCL(s) is granular activated carbon. This treatment may provide an ancillary benefit of removing many other substances such as any new emerging chemicals and other unregulated, not well studied PFAS.

COSTS

Where data was available to derive estimates of implementation costs, the information including all assumptions was provided in the January 4, 2019, report. These estimates have been updated based on the newly proposed standards (i.e. costs to public water systems, groundwater discharge permittees and landfill and hazardous waste site ground water management permittees). Public comments were broadly received commenting on the methods used by NHDES and providing recent quotes for treatment systems in design or implementation. Some of these updated costs validated the methods used by NHDES and none of the comments identified any systemic flaws in the approach used. Therefore, NHDES has chosen to continue to use the original assumptions which provide uniformity across source types and allow direct comparison of the costs resulting from the lowered standards. The following table provides the summary of the initial cost estimates and the new estimated costs.

PFAS Source Type	Initial Proposal Estimate	Final Proposal Estimate
Public Water Systems*	Initial Treatment Costs: $1,851,354 - $5,171,022 Initial Sampling: $1,102,500 - $2,836,000 Annual O&M Costs: $114,912 - $223,439 Annual Sampling Costs $73,055 - $184,825	Initial Treatment Costs: $65,046,987 - $142,822,884 Initial Sampling: $1,102,500 - $2,836,000 Annual O&M Costs: $6,914,552 - $13,444,963 Annual Sampling Costs $174,257 - $444,409
Active Hazardous Waste Sites*	Initial Corrective Action Costs:	Initial Corrective Action Costs:

	$1,350,000 _ $2,310,000 Annual Operating Costs: $570,000 - $1,020,000	$2,315,000 - $4,440,000 Annual Operating Costs: $980,000 - $1,795,000
Municipal Landfills*	Initial Corrective Action Costs: $380,000 – 755,000 Annual Operating Costs: $260,000 - $390,000	Initial Corrective Action Costs: $935,000 - $1,755,000 Annual Operating Costs: $465,000 - $770,000
Wastewater Discharges to Groundwater*	Initial Corrective Action Costs: $1,100,000 Annual Operating Costs: $200,000 - $400,000	Initial Corrective Action Costs: $5,000,000 Annual Operating Costs: $ 849,000 - $1,600,000

* Assumptions for public water systems are contained in the January 9, 2019, report and include treatment of sources that exceed the MCL verses taking the well off line, blending or inter-connecting. For all other costs categories, see attached tables that provide assumptions and calculations used to create these estimates.

Adopting MCLs and AGQSs does not require private well owners to test for or treat their water supplies. However, given the publicity concerning these contaminants and the low standards for them in public drinking water, it is likely that many homeowners may voluntarily choose to test and install treatment in their homes. Based on sampling in areas without likely sources of PFAS contamination, NHDES estimates that as much as 9% of the estimated 250,000 private wells will exceed the proposed standards which could result in an estimated initial cost of treatment of $70,895,522 and annual maintenance cost of $21,268,657. This is likely an overestimation since some homeowners will choose not to test, and some who test will choose not to treat.

In general, the qualitative explanation for sites that may be potential sources of contamination for which we have no or very limited data remains the same as what was presented in the January report. An exception to this is municipal fire stations. Based on an ongoing initiative to test 34 fire stations that may have used AFFF foams and are located in close proximity to wells, only 2 have levels above the proposed standards to date. This suggests there may be limited occurrence of PFAS at levels above the proposed standards near fire stations and accordingly costs associated with this potential source type may be overestimated in the January 9, 2019 report.

ATTACHMENT C

American Water Works Association
Dedicated to the World's Most Important Resource™

Government Affairs Office
1300 Eye Street NW
Suite 701W
Washington, DC 20005-3314
T 202.628.8303
F 202.628.2846

August 8, 2019

Lilia Ledezma
Analyst, Public and Private Mandates Unit
Congressional Budget Office
Ford House Office Building, Room 441 A
Second and D Streets, SW
Washington, DC 20515-6925

RE: S.1507 - PFAS Release Disclosure Act

Dear Ms. Ledezma,

The American Water Works Association has compiled the following information in response to your information request. The following is preliminary, reflecting the need to gather information quickly so as to be timely and useful to the Congressional Budget Office's work.

AWWA focused on responding to the following questions:

1. How would bill S. 1507 affect private and public water systems, state, local and tribal governments?
    a. setting new monitoring and testing processes (if needed)
        i. testing, monitoring, and reporting new requirements to the Safe Drinking Water Act including collecting samples, training personnel, reporting.
    b. remediation costs, including
        i. new treatment technology to remove substances
        ii. new personnel
        iii. training personnel
    c. coordination with nearby industries that may release the contaminants

2. Where is there a recent report estimating testing and data collection costs relevant to S. 1507?

The questions posed do not address the public health benefits associated with the control of per- and polyfluoroalkyl substances (PFAS). We would refer you to the Office of Groundwater and Drinking Water at the U.S. Environmental Protection Agency for assistance estimating the benefits of S. 1507 requirements.

As you will see in the attached several EPA documents can be referenced in estimating the administrative burden and monitoring and reporting requirements associated with the S.1507. There are a number of data gaps associated with estimating the cost of drinking water treatment associated with the legislation. The attached includes a discussion of the information sources and considerations for such an analysis. AWWA also prepared a preliminary estimate to illustrate the analysis that is feasible with available information, particularly recognizing the limited time available to your office to prepare an estimate.

- Depending on how the legislation is finalized we found the potential capital costs associated with implementing drinking water treatment to remove perfluorooctanoic acid (PFOA); and perfluorooctane sulfonic acid (PFOS) in drinking water to quickly exceed $3 billion and, if federal implementation were to mirror the direction of state-level efforts, capital costs would exceed $38 billion.
- In addition to debt service, recurring annual operation and maintenance (O&M) costs reach $150 million, and could reach $1.3 billion for a drinking water maximum contaminant level (MCL) for PFOA and PFOS.
- There is the potential, given the limited understanding of PFAS removal that a treatment standard would be based on reverse osmosis and entail more than $530 billion in capital investment and over $16 billion in annual O&M costs.

In preparing this analysis we were not able to adequate represent all consequences of the legislative text, e.g.,

- Community-level response, including the addition of water treatment, in response to health advisories for PFAS as described in S.1507
- Loss of water supply and associated water system resiliency
- Implications for state revolving loan fund allocation
- Availability of funds for other infrastructure investments like implementation of the Long-Term Lead and Copper Rule.

Please see the attached responses to the questions posed in the attached. An extract of the relevant S.1507 legislative text is also included for reference.

If you have any questions regarding the attached, please contact Steve Via or Chris Moody at (202) 628-8303.

Best regards,

G. Tracy Mehan, III
Executive Director for Government Affairs
American Water Works Association

cc: Jennifer McLain, EPA/OW/OGWDW
Andrew Hanson, EPA/IGA

Who is AWWA

The American Water Works Association (AWWA) is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founded in 1881, the Association is the largest organization of water supply professionals in the world. Our membership includes more than 4,000 utilities that supply roughly 80 percent of the nation's drinking water and treat almost half of the nation's wastewater. Our 50,000-plus total membership represents the full spectrum of the water community: public water and wastewater systems, environmental advocates, scientists, academicians, and others who hold a genuine interest in water, our most important resource. AWWA unites the diverse water community to advance public health, safety, the economy, and the environment.

ATACHMENT 1. RESPONSES TO QUESTIONS POSED

How would bill S. 1507affect private and public water systems, state, local and tribal governments?

Under the Safe Drinking Water Act (SDWA), there is no distinction between private and public water systems. All are treated the same. In either instance, the cost of implementing federal requirements are passed on directly to ratepayers. Relevant SDWA definitions (42 U.S. Code § 300f. Definitions) include:

> Public Water System -- "The term "public water system" means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals. …"
>
> Community water system (CWS)– "means a public water system that—(A) serves at least 15 service connections used by year-round residents of the area served by the system; or (B) regularly serves at least 25 year-round residents."
>
> Noncommunity water system (NCWS)– "a public water system that is not a community water system."

Note that standards set under SDWA do not apply to individual, household wells.

CWSs may be operated by local government (e.g., a village, town, city, county), a creature of local government (e.g., a public service authority), or a creature of the state (e.g., Massachusetts Water Resource Authority). Local government may also contract or sell the operation of water infrastructure to a private utility (e.g., a for-profit company, non-profit cooperative, etc.). In any of these instances, local government is directly or indirectly engaged in oversight of the CWS.

Based on data from the Safe Drinking Water Information System (SDWIS), 46% of CWSs are privately owned. Importantly the majority of those CWSs that are privately owned serve less than 500 persons. These CWSs may be subdivisions, manufactured home communities, public housing developments or apartment buildings that have their own water system. These CWSs would, like municipally-based systems, pass the cost of regulatory implementation on to the year-round residents, if not through rates, through other fee / cost mechanisms.

Seventy percent of Non-transient NCWSs (NTNCWSs) are privately owned reflecting the nature of NTNCWSs (e.g., schools, factories, office buildings, and hospitals which have their own water systems). These NTCWSs would incorporate the cost of compliance into their operating budgets, passing those costs on as necessary. For example, in the case of public schools these costs come back to local government budget processes.

While states may own / operate water systems that are regulated under SDWA, the primary burden on states is the oversight of rule implementation. Implementation of SDWA is delegated to states and some

tribes also implement SDWA. EPA provides direct implementation in the District of Columbia, Wyoming, and U.S. territories. Oversight entails:

1. Changing appropriate state regulations to incorporate and implement the new federal requirements (such changes can require state legislative action)
2. Modifying existing data systems in collaboration with EPA to track compliance
3. Informing systems of compliance obligations
4. Supervising system compliance strategies including construction of capital facilities
5. Processing of compliance monitoring data and PWS reports (e.g., monthly operating reports)
6. Modification and execution of sanitary surveys and other mechanisms used to ensure compliance (beyond monitoring compliance data)
7. Modification of operator certification testing
8. Ensuring that training is available to support operator certification
9. Directing state capacity assistance programs and associate support programs to assist systems (typically small systems) with compliance challenges

The Association of State Drinking Water Administrators has prepared a recent analysis of state oversight program costs for potential revisions to the Lead and Copper Rule. While that analysis does not directly address the cost of implementing a new MCL it does illustrate the nature of rule implementation. The study, Costs of States' Transactions Study (CoSTS) For Potential Long-Term Revisions to the Lead and Copper Rule (LT-LCR) (April, 2018) is available at https://www.asdwa.org/wp-content/uploads/2018/05/CoSTS-Report-Final-2018.pdf.

Section 5 of EPA's Health Risk Reduction and Cost Analysis of the Proposed Perchlorate National Primary Drinking Water Regulation illustrates the burden of rule implementation (May 2019, EPA 816-R-19-004, (EPA-HQ-OW-2018-0780-0124), Available at https://www.regulations.gov/document?D=EPA-HQ-OW-2018-0780-0124). In referencing this material, note that perchlorate in an inorganic contaminant within the SDWA Standard Monitoring Framework and consequently less frequent monitoring requirements apply.

Number of Systems to Consider in Evaluating Treatment and Monitoring Costs

The number of impacted systems is based on data available from SDWIS. If previous rules offer insight into implementation of S. 1507 requirements, then provisions are likely applicable to both CWSs and NTNCWSs. There are 49,678 CWSs and 17,558 NTNCWSs that are currently identified as active in SDWIS, which would likely be required to comply with regulatory requirements under S.1507 provisions and thus undertake monitoring and potentially incur the cost of additional drinking water treatment.

Number of CWS and NTNCWS by System Size

Size Category	Population Range	System Count		
		CWS	NTNCWS	Total
1	0–100	11,788	8,456	20,244
2	101–500	15,207	6,465	21,672
3	501–1,000	5,342	1,569	6,911
4	1,001–3,300	7,999	874	8873
5	3,301–10,000	4,994	154	5148
6	10,001–50,000	3,343	38	3381
7	50,001–100,000	567	1	568
8	100,001–1,000,000	414	1	415
9	> 1,000,001	24	0	24
	Total	49,678	17,558	67,236

More detailed population category breakdowns are available through SDWIS.

Roughly 15% of CWS and NTNCWS are consecutive systems. That is, they purchase water from another water system. This is an important distinction for estimating the impacts of legislative action in that:

1. All water systems must comply with SDWA provisions independently (every PWS stands alone when it comes to compliance).
2. All water systems subject to a rule must conduct the associated monitoring.
3. When a new requirement takes effect, water systems must evaluate how best to comply, it may be that:
    a. The wholesale water system supplying water to a consecutive system does not have elevated contaminant levels warranting treatment.
    b. The wholesale system must install treatment and pass that cost on to its own customers and it wholesale accounts.
    c. The combination of supplies available to the consecutive system are such that it must install treatment itself, build / utilize an intertie with an alternative wholesale system, or develop a new source of supply.
    d. The consecutive system's customers are best served by consolidating with another water system in order to comply.

Regardless of whether a wholesale system or the consecutive system constructs additional treatment facilities to comply with requirements, additional treatment capacity is required to meet the water supply demand of all of impact system's service population.

Number of CWS and NTNCWS by Source of Supply

Size Category	Population Range	Ground Water	Surface Water	Purchased
1	0–100	18,656	555	1,015
2	101–500	18,268	745	2,648
3	501–1,000	5,214	368	1,325
4	1,001–3,300	5,796	931	2,143
5	3,301–10,000	2,716	977	1,454
6	10,001–50,000	1,321	978	1,082
7	50,001–100,000	157	221	190
8	100,001–1,000,000	72	246	97
9	> 1,000,001	2	21	1
	Total	52,202	5,042	9,955

Note – Incomplete information in SDWIS leads to discrepancies in totals.

Where is there a recent report estimating testing and data collection costs relevant to S. 1507?

S. 1507 includes two different sampling requirements:

1. Expansion of Unregulated Contaminant Monitoring to include all PFAS for which there is an analytical method and
2. Monitoring to support implementation of the required primary drinking water standard for PFAS.

There are a number reference documents CBO should be aware of with respect to estimating the federal, state and system level costs associated with monitoring. Those references include:

1. Information Collection Request Summaries for the Unregulated Contaminant Monitoring Rule
    a. Statistical Design and Sample Selection for the Unregulated Contaminant Monitoring Regulation (1999), August 2001, EPA 815-R-01-004 (EPA-HQ-OW-2009-0090-0131), (Available at https://www.regulations.gov/document?D=EPA-HQ-OW-2009-0090-0131)
    b. Information Collection Request Renewal for the Unregulated Contaminant Monitoring Rule (UCMR 3), March 2012, (EPA-HQ-OW-2009-0090-0143) (Available at https://www.regulations.gov/document?D=EPA-HQ-OW-2009-0090-0143)

c. Information Collection Request Renewal for the Unregulated Contaminant Monitoring Rule (UCMR 4), EPA 815-B-15-003, November 2015. (EPA-HQ-OW-2015-0218-0056) Available at (file:///C:/Users/svia/Downloads/EPA-HQ-OW-2015-0218-0056%20(1).pdf)

2. Information Collection Request Summaries for the SDWA Inorganic Contaminant Rule

   a. Information Collection Request (ICR): Disinfectants/Disinfection Byproducts, Chemical, and Radionuclides Information Collection Request, April 2004 (EPA-HQ-OW-2004-0009-0002) Available at file:///C:/Users/svia/Downloads/EPA-HQ-OW-2004-0009-0002.pdf

   b. ICR History is available at https://www.reginfo.gov/public/Forward?SearchTarget=PRA&textfield=+2040-0204

Unregulated Contaminant Monitoring Rule Monitoring

Section 2021 of the America's Water Infrastructure Act of 2018 (P.L. 115-270, Available at https://www.congress.gov/bill/115th-congress/senate-bill/3021?q=%7B%22search%22%3A%5B%22Public+Law+115%5Cu2013270%22%5D%7D&s=7&r=1) requires EPA, if funds are available, to collect data from all public water systems serving more than 3,300 persons and a statistically valid sample of smaller systems in future UCMR cycles. There is parallel text with respect to UCMR monitoring in S. 1507 for the required PFAS monitoring. EPA-HQ-OW-2009-0090-0131 provides an explanation of the statistical basis for the UCMR sampling. All public water systems (PWS) serving more than 10,000 persons incur all UCMR monitoring costs while EPA is to fund sampling, analysis, and related shipping (e.g., bear the cost of monitoring). If implemented as drafted, the cost of this provision would be in addition to monitoring costs for the fifth round of UCMR monitoring rather than a component of UCMR5.

The implication of this guidance as discussed by EPA at its July 16, 2019, UCMR5 stakeholder meeting is that future UCMRs will involve sampling from all public water systems serving more than 3,300 persons (9,512 systems) and a sample of more than 800 systems serving less than 3,300 persons.[1] Whether additional federal funding will be available to extend monitoring to include these 5,147 water systems is unknown. Past UCMR implementation costs are captured in a few specific tables in the EPA information collection request justifications:

- EPA-HQ-OW-2009-0090-0143 illustrates the cost burdens associated with UCMR monitoring for PFAS under UCMR3. EPA-HQ-OW-2015-0218-0056 illustrates cost burdens for the current UCMR4 cycle but does not specifically include monitoring for PFAS compounds.
- Exhibit 7 and 8 in EPA-HQ-OW-2004-0009-0002 summarize the burden of ongoing monitoring under SDWA including the Volatile Organic Compound and Synthetic Organic Contaminants monitoring which would be models for monitoring to support PFAS MCLs.

[1] The presentation materials are not yet posted to the EPA UCMR website but are anticipated in the near future (https://www.epa.gov/dwucmr/unregulated-contaminant-monitoring-rule-ucmr-meetings-and-materials).

During the UCMR5 stakeholder meeting in July EPA indicated that it would have two PFAS analytical methods available (EPA Method 537.1 and 533). Method 537.1 is currently available for use; Method 533 is still in development, consequently cost and performance information is incomplete at this time.

The cost of implementing UCMR at the federal, state, and water system level is a five-year endeavor. While the direct costs associated with monitoring occur over a three-year window, there is a year of pre-monitoring preparation, and for EPA, states, and some systems a final year of data quality control and report generation. It is likely that the costs of expanding the current program to the larger sample as directed in AWIA / S.1507 will require additional investment in federal and state personnel, contractor support, and improvement of data systems, above and beyond extrapolation of the current implementation costs to 5,147 more systems.

Compliance Monitoring

Currently, requirements for monitoring regulated VOCs and SOCs adhere to the SDWA "Standard Monitoring Framework." The monitoring framework is summarized in two documents:

1. Standard Monitoring Framework, February 1991. (EPA 570/F-91-045) (Available at https://nepis.epa.gov/Exe/ZyPDF.cgi/10003I17.PDF?Dockey=10003I17.PDF)
2. The Standardized Monitoring Framework: A Quick Reference Guide, March 2004, (EPA 816-F-04-010) (Available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=3000667K.txt)

Important elements to reflect in costing compliance monitoring for PFAS include:

1. Costs are likely to be borne by all CWS and NTNCWS (i.e., approximately 67,236 systems).
2. The cost of monitoring of analytical methods like EPA Method 537.1 is as much as $500 per sample (EPA Method 537.1 would be adequate to support PFOA an PFOS monitoring; it could also support monitoring other PFAS for which EPA is preparing risk assessments).
3. Sample costs are by entry-point-to-the distribution system, not water system. Most water systems have multiple EPTDSs. EPA has a standard table of EPTDS/system as a function of system size based on the Community Water System Survey (last published in 2009, Available at https://www.epa.gov/dwstandardsregulations/community-water-system-survey). See following table.

Number of EPTDS and Associated Design Flows as a Function of System Size

Size Category	Population Range	Entry Points/ System	Design Flow from each Entry Point (gpm)
1	0–100	2.4	5
2	101–500	2.0	35
3	501–1,000	2.1	82
4	1,001–3,300	1.9	252
5	3,301–10,000	2.2	657
6	10,001–50,000	3.1	2,027
7	50,001–100,000	4.1	3,767
8	100,001–1,000,000	6.6	16,283
9	> 1,000,001	14.5	19,906

4. As described in EPA 816-F-04-010 it is possible for systems to be allowed to take smaller numbers of samples over time, but at a minimum sampling is quarterly for the initial three years of sampling. At which time the system may be eligible for reduced monitoring at the primacy agency's discretion. In current practice, detection of a contaminant means that sampling will be ongoing on at least an annual basis and observation at levels closer to the MCL warrant more regular monitoring. There is variability in burden as a function of system size and whether the supply is groundwater or surface water. Groundwater is generally judged to be less variable over time than surface water, so reduced monitoring is available more rapidly.
5. The EPA summary of current compliance monitoring costs reflect ongoing mature monitoring costs, where there are monitoring waivers or reduced monitoring in place, rather than reflecting start-up monitoring.
6. The fact sheet, Per- and Polyfluoroalkyl Substances (PFASs) Monitoring, Sampling, and Analysis (July 2019, Available at https://www.awwa.org/LinkClick.aspx?fileticket=ufb-Vl3VrVY%3d&portalid=0) provides a brief overview of PFAS analytical methods.

New Treatment Technology to Remove Substances

S. 1507 directs EPA to regulate perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). It also directs EPA to evaluate a regulatory option where a measure of total PFAS is employed.

The national cost of a regulation for PFAS will vary significantly based on two regulatory decisions: (1) the specific PFAS that are included in the regulation and (2) the maximum contaminant levels (MCLs). These two factors will determine the number of systems that are impacted as well as the treatment objectives of the facilities, which may require different, or multiple, types of treatment technology for compliance.

Should EPA finalize risk assessments for additional PFAS, six such assessments are underway, then these too would lead to addition of drinking water treatment in some communities. There is not enough information from these risk assessment processes, treatment studies, and occurrence data to adequately

inform the current effort. Several of these PFAS are less amenable to drinking water treatment than PFOA and PFOS.

Approach to Preparing Preliminary Cost Estimation

AWWA prepared an illustrative national cost analysis using available information to demonstrate both the challenges of developing such an analysis and the policy relevance of an estimate. The following cost estimate is based on:

1. Data from Safe Drinking Water Information System (SDWIS) to determine the number of systems in each size category.
2. Water Treatment Plant design flows and numbers of treatment facilities per water system size category as utilized by EPA in its cost analyses. (see above table).
3. Initial capital cost and recurring annual operation and maintenance (O&M) costs from representative projects with similar treatment technologies and/or with the objective of PFAS removal. Data was used to develop cost models to project these costs based on the water system size. Cost data was collected for treatment processes relevant to PFAS including activated carbon, ion exchange and reverse osmosis. These processes were considered since they are the most studied, and most effective, processes for removing PFOA and PFOS. It is important to note that these treatment processes have more limited research on removal of other PFAS and typically have varying degrees of removal success based on the individual PFAS in the drinking water.
4. PFAS monitoring data from the Third Unregulated Contaminant Monitoring Rule, which was used along with SDWIS data to determine the number of water systems in each size category that would be impacted by potential PFAS regulations of 20 ppt, 40 ppt, and 70 ppt. Importantly, these estimates are based on occurrence data for PFOA and PFOS, not all PFAS, in public water systems.

In the rulemaking process, EPA will prepare a more detailed cost analysis. When EPA conducts its analysis, its practice is to estimate the number of systems that are likely to be triggered to install treatment and to forecast the distribution of treatment technologies that will be applied (e.g., x percent will utilize granular activated carbon, y percent will utilize ion exchange). Because such forecasts require more information than is currently available the best option for a planning level national cost estimate is to represent the national cost assuming all systems used a particular technology (e.g., all systems used GAC, all systems used IX, all systems used reverse osmosis). EPA will also be better positioned to take into account the impact of individual state regulations on the number of water systems that will make treatment changes to comply with requirements resulting from S.1507.

While the treatment technologies used for this estimate are well known, their applicability on PFAS is still a topic of active research. The choice of a particular technology, or combination of technologies, is not only dependent on treatment objectives for PFAS but also the system's existing facilities, other treatment objectives or requirements, and the characteristics of the water they are trying to treat. As noted above, the costs reflected here are for treatment based on PFOA and PFOS occurrence, not the level of treatment required. Some PFAS are not as readily removed as others leading to more rapid breakthrough of GAC and IX media, consequently some systems may have more expensive treatment processes based on the need to replace media more often. Setting individual compound treatment goals at lower

concentrations or summing more compounds within a single numeric limit has a similar effect – necessitating more frequent replacement of the media.

National Capital Cost to Install Treatment

Treatment Objective	Capital Costs ($ millions)		
	Granular Activated Carbon	Ion Exchange	Reverse Osmosis
< 70 ng/L	$2,100 - $4,400	$1,900 - $4,100	$5,700 - $12,000
< 40 ng/L	$5,600 - $12,000	$5,400 - $12,000	$15,000 - $33,000
< 20 ng/L	$23,000- $50,000	$22,000 - $48,000	$63,000 - $140,000
Treatment Technique	$140,000 - $290,000	$130,000 - $280,000	$370,000 - $800,000

National Annual Operating and Maintenance Cost for Installed Treatment

Treatment Objective	**Annual Recurring Costs ($ millions)**		
	Granular Activated Carbon	Ion Exchange	Reverse Osmosis
≤ 70 ng/L	$44 - $90	$210 -$460	$190 - $410
≤ 40 ng/L	$110 - $240	$540 - $1,200	$480 -$1,000
≤ 20 ng/L	$460 - $980	$2,200 - $4,800	$2,000 - $4,200
Treatment Technique	$2,700 - $5,800	$13,000 - $28,000	$12,000 - $25,000

In describing treatment costs, it is important to consider both capital and O&M costs. When making site-specific treatment decisions water systems will try to achieve reliable treatment while managing project life-cycle costs, and do so with a margin of safety. Consequently, in some scenarios what in general looks like the least cost option will not be the most effective investment for a given water system. Because investments in advanced treatment are long-term investments, uncertainty in treatment objectives leads to conservatism beyond simply assuring reliable compliance with an MCL; this too leads actual system improvements toward consideration of more conservative treatment goal, use of multiple unit operations and selection of more expensive treatment technologies.

As noted above, the treatment objective is a significant determinant of cost. The above tables illustrate four different regulations. These national estimates are a function of the number of systems estimated to require additional treatment based on combined PFOA and PFOS levels exceeding the regulatory limits. While we have information from UCMR 3 and state level efforts, which can be used estimate the occurrence of PFOA and PFOS, there is not an analysis of the occurrence of PFAS as a class, or a surrogate measure of PFAS. The above estimates based on treatment objectives of 70, 40, and 20 ng/L reflect reported UCMR occurrence data and subsequent re-analysis of UCMR data. The final row in the table reflects a duty by all CWS and NTNCWS to meet a treatment standard. This is a regulatory approach that is used when an adequate analytical method is not available for a contaminant.

As noted above, EPA has a duty under SDWA to prepare a sound benefit-cost estimate for a rulemaking, that estimate will need to overcome significant limitations in the above analytical approach by:

1. Being based on demonstrated removal efficiencies for all of the target contaminants.
2. Forecasting the distribution of treatment technologies taking the actual target contaminants and water matrix effects into account.
3. Incorporating the additional SDWA treatment requirements associated with adding advanced treatment to what are now small groundwater systems without treatment.

EPA will also be better able to take into account consequences of this and other legislative actions. To the extent that state or federal legislation action impacts (1) stack emissions from GAC regeneration (e.g., controls on stack emissions), (2) requires disposal of GAC or IX media as hazardous waste, or (3) restricts the release of PFAS through NPDES permits, those costs will need to be incorporated into the cost of drinking water treatment. The costs associated with residual stream management can be quite significant. While data is not available for PFAS, analyses conducted to inform the California Hexavalent Chromium MCL process demonstrate the impact of residuals management on treatment option selection and implementation costs.[2] To the extent that compliance is reliant on technologies like reverse osmosis, in the absence of significant technological advances, brine disposal for many communities relies on disposal in Underground Injection Control program wells.

Note that as the CBO request included a specific query on administration and monitoring costs, the above treatment costs do not include either – they are simply a planning level estimate (i.e., -30% /+50% estimate for the cost of implementing necessary treatment facilities to address PFAS in drinking water systems. A cost estimate should also consider the following financial implications due to the new regulations with respect to system resiliency, e.g.,

- If, and how, the investment in treatment might increase, or decrease, protection against other likely water quality risks?
- To what degree will available water supplies be reduced (e.g., water supply wells taken off-line, impacts on ongoing aquifer storage and recovery programs, creation of brine streams, etc.)?
- How will the treatment investment impact funding availability for other infrastructure investments like implementation of the Long-Term Lead and Copper Rule?

[2] Arcadis. Final Report – Hexavalent Chromium Treatment Residuals Management, March 27, 2012, (Prepared for the Association of California Water Agencies and the City of Glendale Water and Power.
Chad J. Seidel, Issam N. Najm, Nicole K. Blute, Christopher J. Corwin, XueyiNg Wu, National and California treatment costs to comply with potential hexavalent chromium MCLs, Journal AWWA, First published: 01 June 2013 https://doi.org/10.5942/jawwa.2013.105.0080.

ATTACHMENT 2. REFERENCES FOR TREATMENT COST ESTIMATE

PFAS Treatment Project References for Treatment Cost Estimate

Facility	Treatment Capacity	Treatment Option	Capital Cost Estimate	Annual O&M Estimate
Cape Fear Public Utility Authority[1]	44 MGD	GAC	$46M	$2.7M
		IX	$46M	$2.1M
		RO	$150M	$4.7M
Brunswick County Public Utilities[2]	36 MGD	RO	$99M	$2.9M
		Ozone w/Biofiltration and GAC	$99M	$4.7M
		GAC w/IX and UV-AOP	$84M	$4.7M
Merrimack Village District (MVD)[3]	2.88 MGD	GAC	$3.6M to $4.3M	$0.13M to $0.27M
		IX	$4.4M to $5.1M	$0.12M to $0.19M
	1.44 MGD	GAC	$6.9M	$0.12M to $0.19M
		IX	$7.4M	$0.25M to $0.61M
	4.32 MGD	GAC	$10.9M	$0.24M to $0.43M
		IX	$12.2M	$0.52M to $1.4M
City of Portsmouth (Pease)[4]	1.67 MGD	GAC	$13M	$0.16M
West Morgan East Lawrence Water Authority[5]	8 MGD	GAC	$4M	$0.6M
		RO	$40M to $80M	N/A
Ann Arbor, MI[6]	22 MGD	GAC	N/A	$0.35M
Issaquah, WA[7,8]	0.36 MGD	GAC	$1M	N/A

1. https://www.cfpua.org/DocumentCenter/View/11386/BlackVeatch_FinalReport
2. https://www.brunswickcountync.gov/wp-content/uploads/2018/04/CDM-Smith-Brunswick-Final-Report-April-2018.pdf
3. http://www.mvdwater.org/wp-content/uploads/2018/12/PFAS-Treatment-Feasibility-Report-237-8-Final.pdf
4. http://files.cityofportsmouth.com/publicworks/Pease%20Well%20Treatment%20Cost%20Alternative%20Report%20-%20June%202017%20(Final).pdf
5. https://www.waaytv.com/content/news/WAAY-31-I-Team-Investigation-Cleaning-contaminated-water-483249661.html
6. https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/05.15.19 Witness Testimony_Steglitz.pdf
7. https://pfasproject.com/issaquah-washington/
8. https://www.issaquahwa.gov/DocumentCenter/View/2810

Similar Treatment Process Project References for Treatment Cost Estimate

Facility	Treatment Capacity	Treatment Option	Capital Cost Estimate	Annual O&M Estimate
Aurora, CO[1]	10 MGD	Brackish RO	$33M	N/A
Multiple Systems, TX[2]	1.2 to 27.5 MGD	Brackish RO	$2.75M to $118M[4]	$0.5M to $6.5M[4]
Multiple Systems, FL[4]	2.0 to 10 MGD	IX	$0.85M to $4M	N/A
State of Industry Model[5]	2.7 to 27 MGD	Brackish RO	$9.5M to $60M[4]	N/A
	0.1 to 10 MGD	Brackish RO	N/A	$0.06 to $2M[4]

1. https://awwa.onlinelibrary.wiley.com/doi/pdf/10.5942/jawwa.2017.109.0020
2. http://www.twdb.texas.gov/innovativewater/desal/doc/Cost_of_Desalination_in_Texas_rev.pdf
3. In some cases, reported cost estimates are greater than 5 years old and have been updated to reflect inflation.
4. https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=7837&context=etd
5. https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/programs/conf2011/pdf/Lozier.pdf

ATTACHMENT 3. EXCERPT OF RELEVANT TEXT FROM S.1507 - PFAS RELEASE DISCLOSURE ACT

TITLE II—DRINKING WATER

SEC. 201. NATIONAL PRIMARY DRINKING WATER REGULATIONS FOR PFAS.

Section 1412(b)(2) of the Safe Drinking Water Act (42 U.S.C. 300g–1(b)(2)) is amended by adding at the end the following:

"(D) PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES.—

"(i) IN GENERAL.—Not later than 2 years after the date of enactment of this subparagraph, the Administrator shall promulgate a national primary drinking water regulation for perfluoroalkyl and polyfluoroalkyl substances, which shall, at a minimum, include standards for—

"(I) perfluorooctanoic acid (commonly referred to as 'PFOA'); and

"(II) perfluorooctane sulfonic acid (commonly referred to as 'PFOS').

"(ii) ALTERNATIVE PROCEDURES.—

"(I) IN GENERAL.—Not later than 1 year after the validation by the Administrator of an equally effective quality control and testing procedure to ensure compliance with that national primary drinking water regulation to measure the levels described in subclause (II) or other methods to detect and monitor perfluoroalkyl and polyfluoroalkyl substances in drinking water, the Administrator shall add the procedure or method as an alternative to the quality control and testing procedure described in that national primary drinking water regulation by publishing the procedure or method in the Federal Register.

"(II) LEVELS DESCRIBED.—The levels referred to in subclause (I) are—

"(aa) the level of a perfluoroalkyl or polyfluoroalkyl substance;

"(bb) the total levels of perfluoroalkyl and polyfluoroalkyl substances; and

"(cc) the total levels of organic fluorine.

"(iii) INCLUSIONS.—The Administrator may include a perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances on—

"(I) the list of contaminants for consideration of regulation under paragraph (1)(B)(i); and

"(II) the list of unregulated contaminants to be monitored under section 1445(a)(2)(B)(i).

"(iv) MONITORING.—When establishing monitoring requirements for public water systems as part of a national primary drinking water regulation under clause (i) or clause (vi)(II), the Administrator shall tailor the monitoring requirements for public water systems that do not detect or are reliably and consistently below the maximum contaminant level (as defined in section 1418(b)(2)(B)) for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances subject to the national primary drinking water regulation.

"(v) HEALTH RISK REDUCTION AND COST ANALYSIS.—In meeting the requirements of paragraph (3)(C), the Administrator may rely on information available to the Administrator with respect to 1 or more specific perfluoroalkyl or polyfluoroalkyl substances to extrapolate reasoned conclusions regarding the health risks and effects of a class of perfluoroalkyl or polyfluoroalkyl substances of which the specific perfluoroalkyl or polyfluoroalkyl substances are a part.

"(vi) REGULATION OF ADDITIONAL SUBSTANCES.—

"(I) DETERMINATION.—The Administrator shall make a determination under paragraph (1)(A), using the criteria described in clauses (i) through (iii) of that paragraph, whether to include a perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances in the national primary drinking water regulation under clause (i) not later than 18 months after the later of—

"(aa) the date on which the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances is listed on the list of contaminants for consideration of regulation under paragraph (1)(B)(i); and

"(bb) the date on which—

"(AA) the Administrator has received the results of monitoring under section 1445(a)(2)(B) for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substance; or

"(BB) the Administrator has received finished water data or finished water monitoring surveys for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances from a Federal or State agency that the Administrator determines to be sufficient to make a determination under paragraph (1)(A).

"(II) PRIMARY DRINKING WATER REGULATIONS.—

"(aa) IN GENERAL.—For each perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances that the Administrator determines to regulate under subclause (I), the Administrator—

"(AA) not later than 18 months after the date on which the Administrator makes the determination, shall propose a national primary drinking water regulation for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances; and

"(BB) may publish the proposed national primary drinking water regulation described in subitem (AA) concurrently with the publication of the determination to regulate the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances.

"(bb) DEADLINE.—

"(AA) IN GENERAL.—Not later than 1 year after the date on which the Administrator publishes a proposed national primary drinking water regulation under item (aa)(AA) and subject to subitem (BB), the Administrator shall take final action on the proposed national primary drinking water regulation.

"(BB) EXTENSION.—The Administrator, on publication of notice in the Federal Register, may extend the deadline under subitem (AA) by not more than 6 months.

"(vii) LIFETIME DRINKING WATER HEALTH ADVISORY.—

"(I) IN GENERAL.—Subject to subclause (II), the Administrator shall publish a health advisory under paragraph (1)(F) for a perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances not later than 1 year after the later of—

"(aa) the date on which the Administrator finalizes a toxicity value for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances; and

"(bb) the date on which the Administrator validates an effective quality control and testing procedure for the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substance, if such a procedure did not exist on the date on which the toxicity value described in item (aa) was finalized.

"(II) WAIVER.—The Administrator may waive the requirements of subclause (I) with respect to a perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl and polyfluoroalkyl substances if the Administrator determines that there is a substantial likelihood that the perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances will not occur in drinking water.".

SEC. 202. MONITORING AND DETECTION.

(a) MONITORING PROGRAM FOR UNREGULATED CONTAMINANTS.—

(1) IN GENERAL.—The Administrator shall include each substance described in paragraph (2) in the fifth publication of the list of unregulated contaminants to be monitored under section 1445(a)(2)(B)(i) of the Safe Drinking Water Act (42 U.S.C. 300j–4(a)(2)(B)(i)).

(2) SUBSTANCES DESCRIBED.—The substances referred to in paragraph (1) are perfluoroalkyl and polyfluoroalkyl substances and classes of perfluoroalkyl and polyfluoroalkyl substances—

(A) for which a method to measure the level in drinking water has been validated by the Administrator; and

(B) that are not subject to a national primary drinking water regulation under clause (i) or (vi)(II) of subparagraph (D) of section 1412(b)(2) of the Safe Drinking Water Act (42 U.S.C. 300g–1(b)(2)).

(3) EXCEPTION.—The perfluoroalkyl and polyfluoroalkyl substances and classes of perfluoroalkyl and polyfluoroalkyl substances included in the list of unregulated contaminants to be monitored under section 1445(a)(2)(B)(i) of the Safe Drinking Water Act (42 U.S.C. 300j–4(a)(2)(B)(i)) under paragraph (1) shall not count towards the limit of 30 unregulated contaminants to be monitored by public water systems under that section.

(b) APPLICABILITY.—

(1) IN GENERAL.—The Administrator shall—

(A) require public water systems serving more than 10,000 persons to monitor for the substances described in subsection (a)(2);

(B) subject to paragraph (2) and the availability of appropriations, require public water systems serving not fewer than 3,300 and not more than 10,000 persons to monitor for the substances described in subsection (a)(2); and

(C) subject to paragraph (2) and the availability of appropriations, ensure that only a representative sample of public water systems serving fewer than 3,300 persons are required to monitor for the substances described in subsection (a)(2).

(2) REQUIREMENT.—If the Administrator determines that there is not sufficient laboratory capacity to carry out the monitoring required under subparagraphs (B) and (C) of paragraph (1), the Administrator may waive the monitoring requirements in those subparagraphs.

(3) FUNDS.—The Administrator shall pay the reasonable cost of such testing and laboratory analysis as is necessary to carry out the monitoring required under paragraph (1) from—

(A) funds made available under subsection (a)(2)(H) or (j)(5) of section 1445 of the Safe Drinking Water Act (42 U.S.C. 300j–4); or

(B) any other funds made available for that purpose.

SEC. 203. ENFORCEMENT.

Notwithstanding any other provision of law, the Administrator may not impose financial penalties for the violation of a national primary drinking water regulation (as defined in section 1401 of the Safe Drinking Water Act (42 U.S.C. 300f)) with respect to a perfluoroalkyl or polyfluoroalkyl substance or class of perfluoroalkyl or polyfluoroalkyl substances for which a national primary drinking water regulation has been promulgated under clause (i) or (vi) of subparagraph (D) of section 1412(b)(2) of the Safe Drinking Water Act (42 U.S.C. 300g–1(b)(2)) earlier than the date that is 5 years after the date on which the Administrator promulgates the national primary drinking water regulation.

SEC. 204. DRINKING WATER STATE REVOLVING FUNDS.

Section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) is amended—

(1) in subsection (a)(2), by adding at the end the following:

"(G) EMERGING CONTAMINANTS.—

"(i) IN GENERAL.—Subject to clause (ii), amounts deposited under subsection (t) in a State loan fund established under this section may be used to provide grants for the purpose of addressing emerging contaminants, with a focus on perfluoroalkyl and polyfluoroalkyl substances.

"(ii) REQUIREMENTS.—

"(I) SMALL AND DISADVANTAGED COMMUNITIES.—Not less than 25 percent of the amounts described in clause (i) shall be used to provide grants to—

"(aa) disadvantaged communities (as defined in subsection (d)(3)); or

"(bb) public water systems serving fewer than 25,000 persons.

"(II) PRIORITIES.—In selecting the recipient of a grant using amounts described in clause (i), a State shall use the priorities described in subsection (b)(3)(A).";

(2) in subsection (m)(1), in the matter preceding subparagraph (A), by striking "this section" and inserting "this section, except for subsections (a)(2)(G) and (t)"; and

(3) by adding at the end the following:

"(t) EMERGING CONTAMINANTS.—

"(1) IN GENERAL.—Amounts made available under this subsection shall be allotted to a State as if allotted under subsection (a)(1)(D) as a capitalization grant, for deposit into the State loan fund of the State, for the purposes described in subsection (a)(2)(G).

"(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to carry out this subsection $100,000,000 for each of fiscal years 2020 through 2024, to remain available until expended."