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February 6, 2025

MS. DENICE NELSON
JOHNSON CONTROLS, INC
5757 N. GREEN BAY AVENUE
MILWAUKEE, WI 53209

Via Email Only to denice.karen.nelson@jci.com

SUBJECT: Response to *GETS Progress Report #4 (Nov. 13, 2023 – Nov. 10, 2024)*
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI
BRRTS #02-38-580694

Dear Ms. Nelson:

On Dec. 20, 2024, the Wisconsin Department of Natural Resources (DNR) received the GETS[1] Semi-Annual Monitoring Report ("GETS Progress Report #4") for the above-referenced site (the "Site"). The report was submitted by Arcadis U.S., Inc. (Arcadis) on behalf of Johnson Controls, Inc. and Tyco Fire Products LP (JCI/Tyco) and was accompanied by the fee required under Wisconsin Administrative Code (Wis. Admin. Code) § NR 749.04(1) for DNR review and response.

JCI/Tyco conducts monitoring to evaluate the effectiveness of the GETS in restoring the environment; the monitoring results and summaries of the GETS's operations and maintenance are reported in semi-annual progress reports to the DNR (Wis. Admin. Code § NR 724.13(3)). GETS Progress Report #4 demonstrates that the GETS interim action is effectively treating the captured groundwater and is reducing the amount of per- and polyfluoroalkyl substances (PFAS) in the environment. However, modifications to the GETS, and/or additional remedial actions, may be needed to restore the environmental to the extent practicable and further control contaminant migration at the Site (Wis. Stat. § 292.11(3)).

JCI/Tyco plans to modify the GETS and submit an updated long-term monitoring plan in 2025. The DNR's review of the current conditions and recommendations for long-term monitoring are presented herein.

Background

JCI/Tyco is investigating and responding to the discharge of PFAS to the environment at the JCI/Tyco Ansul Fire Technology Center (FTC), located at 2700 Industrial Parkway South in Marinette, Wisconsin.

A significant groundwater contaminant plume of PFAS is present at the Site; the concentrations of perfluorooctanoic acid (PFOA) in groundwater on the FTC property and to the east are on the order of 10,000 – 100,000 parts per trillion (ppt). The contaminated groundwater upwells into the surface water in Ditch B, which contributes to PFAS migrating into the Bay of Green Bay.

In Nov. 2022, JCI/Tyco began an interim remedial action – the GETS – with goals to (1) reduce upwelling of PFAS-contaminated groundwater into Ditch B; (2) treat the recovered groundwater to reduce the PFAS concentration in the water; and (3) reduce PFAS-mass flux throughout groundwater plume.

Currently, the GETS includes nine vertical groundwater extraction wells to pump and convey contaminated groundwater through buried pipes to a treatment building on the FTC property. Treatment includes oxidation,

[1] GETS = Groundwater Extraction and Treatment System

filtration, granular activated carbon (GAC) and ion exchange resins to remove PFAS from the groundwater. The treated water is discharged back to Ditch B surface water downstream of where the ditch crosses Pierce Avenue[2].

In 2025, JCI/Tyco has plans to upgrade the treatment capacity and install five new extraction wells for the GETS. The new extraction wells include two near existing extraction wells EX-3 and EX-4 along Ditch B, one new well in the weathered bedrock northeast of the FTC and two new wells near Ditch A on the southern portion of the FTC property. These modifications were described in GETS Progress Report #3 and JCI/Tyco's Oct. 3, 2024, response to comments. JCI/Tyco is currently working to obtain the necessary permits for the proposed changes.

Summary and DNR Review of GETS Progress Report #4

The GETS began operating in Nov. 2022. This is the fourth semi-annual progress report submitted under the current-approved monitoring program (Wis. Admin. Code § NR 724.13(3)). JCI/Tyco plans to submit an updated long-term monitoring plan for approval after its next semi-annual progress report.

GETS Operations:

The following is the DNR's understanding of the GETS operations from Nov. 14, 2022, through Nov. 10, 2024.

- A total of 1,064,327 kilowatt hours (kWh) have been used to extract and treat approximately 219 million gallons of contaminated groundwater (Table 7).
- Approximately 36,000 pounds of ion exchange resin, 208,000 pounds of virgin granular activate carbon (GAC) and 372,000 pounds of regenerated GAC has been used to treat the extracted groundwater.
- All treated groundwater was discharged to surface water in Ditch B near monitoring point SW-M09.
- The GETS is effective at removing PFOA and perfluorooctanesulfonic acid (PFOS) from the groundwater it treats:
    - The average combined influent concentrations from all the extraction wells are approximately 10,000 ng/L for PFOA and 700 ng/L for PFOS (Table 15 and Figure A-3).
    - All the samples of treated effluent had concentrations below the Wis. Admin. Code § NR 102.04 surface water standards for PFOA and PFOS (Table 8).
- The groundwater extraction rates vary between the eight operating extraction wells from approximately 10 to 40 gallons per minute (gpm). The ninth extraction well (EX-9) remains off, except for sampling because it was found to be outside the desired capture area of the plume. The lowest pumping rates are observed in extraction well EX-2, which experiences frequent biofouling (Table 2).
- System modifications and maintenance to address biofouling have improved the overall pumping rates that can be sustained by the GETS. Currently, the collective rate of groundwater extraction of the GETS is approximately 260 gpm, which is an overall increase since startup (Table 7).
- The concentration and mixture of PFAS varies in the groundwater captured by each extraction well:
    - PFOA is the dominant compound to the east; extraction wells EX-6, EX-7 and EX-8 generally capture the highest concentrations of PFOA (Table 6).
    - To the north, extraction well EX-1 captures the highest concentration of total PFAS; the dominant compound being 6:2 fluorotelomer sulfonate (FTS) (Figure A-2).

GETS Performance Evaluation:

The following is an evaluation of the effectiveness of the GETS relative the performance parameters established in Table 4 of the July 12, 2021, *GETS Long-Term Monitoring Plan.*

[2] The discharge of treated water to Ditch B is done under a Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit No. WI-0046566-07-0 and the associated coverage letter dated Oct. 15, 2021. The DNR's Wastewater Program administers the WPDES permit.

From Nov. 14, 2022 (startup) through Nov. 10, 2024:

- The GETS removed approximately 18 pounds of perfluorooctanoic acid (PFOA) and 1.3 pounds of perfluorooctanesulfonic acid (PFOS) from the environment (Table 15). *(How this compares to the total amount of PFAS remaining in the source area has not been determined. Wis. Admin. Code § NR 716.11(3)(d) requires that JCI/Tyco estimate the mass of PFAS in the source area. The amount of PFAS removed by the GETS and expected remedial time frame can then be evaluated relative to this estimate.)*
- The GETS reduced, but did not prevent, the upwelling of groundwater into Ditch B (Table 11, Figures 6 and 7 and Appendix B). Contaminated groundwater continues to enter the northern segment of Ditch B between surface water monitoring points SW-U10 and SW-M09 and the northeastern branch of Ditch B between surface water monitoring points SW-P4B and SW-M09. The upwelling conditions extend farther downstream to surface water monitoring point SW-M04 in the spring.
- The concentrations of PFAS measured in the surface water in Ditch B has decreased; however, the concentrations still frequently exceed the Wis. Admin. Code § NR 102.04 surface water standards for PFOA and PFOS downstream of surface water monitoring point SW-U10 (Figure 8 and Table 14).
- As expected, seasonal and regional changes and short-term precipitation events (i.e., not the GETS) were the strongest influence on shallow groundwater levels and stream flows near the Site (Figures 2 -5); however, an observable capture zone has been established in the shallow groundwater near Ditch B between extraction wells EX-5 to EX-7 (Figure 6-7).
- As expected, the concentrations of PFAS in the groundwater migrating from the FTC toward Ditch B have not changed significantly in the 2 years of GETS operation (Table 13, Figures 10 and 11 and Appendix C). The concentrations and mixture of PFAS in the combined influent of groundwater captured by the GETS have been stable following startup (Appendix A).
- The concentrations of PFOA and 6:2 FTS have shown increasing trends in the groundwater at monitoring well PZ-29-43 following startup of the GETS (Appendix C). Monitoring well PZ-29-43 is downgradient of Ditch B to the northeast and is outside the capture zone of the GETS (Figure 11).

Modifications to the GETS operations, and/or other remedial actions, may be needed to achieve surface water standards in Ditch B and control the migration of PFAS in groundwater northeast of Ditch B.

GETS Proposed Updates and Groundwater Flow Model

A groundwater flow model was previously developed for the Site by Arcadis on behalf of JCI/Tyco. The groundwater flow model was updated to assess the placement of the five new extraction wells and the results of the modeling were included in Appendix D of GETS Progress Report #4. The conclusion is that the addition of the five new wells will enhance groundwater capture, particularly in areas where capture was weaker (along Ditch A and the northern portion of Ditch B).

The general conclusion is reasonable and supported by the model; however, it remains uncertain from the DNR's review of this report if the new extraction wells will prevent upwelling of contaminated water to the degree necessary to achieve surface water standards and reduce migration of PFAS in groundwater northeast of Ditch B.

Although the water levels predicted by the model are calibrated relative to the regional model domain, the model does not appear to be well calibrated or discretized sufficiently in the focused area of interest (i.e., between the FTC and Ditch B to the north and northeast). For example, the model consistently underpredicts water levels in the northern portion of the FTC property by 3 to 7 feet. As a result, it appears that the groundwater upwelling measured in Ditch B to the north and northeast of the FTC (Figure 6 and Figure 7) is not reflected in current conditions predicted by the model (Figure D-6). In addition, use of a steady-state model (as done here) has the tendency to over-predict drawdown and capture of pumping wells.

Thus, it is possible that the model overpredicts the capture area efficiency of the new extraction well, such that contaminated groundwater could continue to upwell into Ditch B to the north and migrate downgradient to the northeast. These conditions are apparent in the site monitoring data collected for the GETS. If these conditions continue, the surface water concentration of PFOA and PFOS may continue to exceed standards in Ditch B and increasing concentrations in groundwater may continue near monitoring well PZ-29-43.

These general comments about the model do not prevent JCI/Tyco from moving forward with its proposed updates to the GETS. However, the updated long-term monitoring plan for the GETS should evaluate the hydraulic and contaminant conditions of surface water in Ditch B and the groundwater downgradient from the GETS to assess if the new pumping wells are achieving the intended effect predicted by the model (Wis. Admin. Code § NR 724.13(2)).

Next Steps

In accordance with the approved July 12, 2021, *GETS Long-Term Monitoring Plan*:

- Submit the GETS Progress Report #5 by **June 25, 2025**.
- Submit updates to the GETS long-term monitoring plan on about the same time as GETS Progress Report #5. The update can be a standalone plan or addendum to the July 12, 2021 monitoring plan. Recommendations to consider in these updates are summarized in Attachment A.
- Submit an addendum to the GETS Construction Documentation Report **within 60 days** after the new construction and treatment modifications to the GETS are complete (Wis. Admin. Code § NR 724.15). Include revisions to applicable portions of the operations and maintenance plan as needed to reflect the design changes (Wis. Admin. Code § NR 724.13(4)).

As a reminder, this Site is subject to an enforcement action and therefore all submittals to the DNR under Wis. Admin. Code chs. NR 700-799 and submittals directed by the DNR must be accompanied by an Wis. Admin. Code ch. NR 749 fee per Wis. Stat. § 292.94. These fees are not pro-ratable or refundable per Wis. Admin. Code § NR 749.04(1). If you have any questions about whether to include a fee with a submittal, please contact DNR staff prior to submitting a document without a fee.

If you have any questions, please contact me at Alyssa.Sellwood@wisconsin.gov or (608) 622-8606.

Sincerely,

Alyssa Sellwood, PE
Water Resources Engineer
Remediation & Redevelopment Program

Attachment A: Recommendations for the Updates to the Long-Term Monitoring Plan

cc: Jodie Thistle, DNR (via email: jodie.thistle@wisconsin.gov)

Attachment A

Recommendations for the Updates to the GETS Long-Term Monitoring Plan

- Wis. Admin. Code § 716.11(3)(d) requires that JCI/Tyco estimate the total mass of contamination in the source area. A conservative approach to mass is recommended to account for precursors and complex fate and transport processes of PFAS. While it is recognized that the WPDES permit only requires the GETS effluent be sampled for PFOA and PFOS, other PFAS (e.g., 6:2 FTS) may need to be monitored occasionally in pre- and post-treatment. Compare the amount of certain PFAS removed by the GETS to the estimated mass in the source area. This will put the mass removed by the GETS into context and assist in assessing the remedial time frame and potential need for other remedial actions.
- Because groundwater conditions are expected to change slowly, JCI/Tyco may want to consider merging the GETS groundwater monitoring components into the interim long-term groundwater monitoring and reporting for the Site. (Relevant figures and concentration trend plots can be pulled from the site-wide groundwater monitoring reports, as needed, to evaluate the influence and impact of the GETS in the GETS Progress Reports. Figures similar to the concentration trends plot and PFAS mixture plots (Appendices A,B and C in GETS Progress Report #4) are recommended for the GETS reporting.
- Future monitoring should continue to include measurements that evaluate hydraulic gradients in the streambed piezometers in Ditch B and that can confirm that lower PFAS concentrations in surface water in Ditch B are not just a dilution effect from the additional treated groundwater that will occur following the proposed system updates (Wis. Admin. Code § NR 724.13(2)). The addition of another piezometer and surface water monitoring location between SW-U10 and SW-03 and a piezometer to measure hydraulic gradients in the streambed of the eastern branch to Ditch B are recommended in the updates.
- Certain data summaries could be consolidated in the semi-annual progress reports for the GETS. (For example, use of visual aids like Figure 3-6 and trend plots in the appendices included in GETS Progress Report #4 could be used instead of detailed summary tables for the GETS reporting.)
- Include monitoring, as needed, to evaluate how of the groundwater and surface water are responding to the planned updates to the GETS.