



September 14, 2021

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SUBJECT: Air Pathway Site Investigation Work Plan: Approval with Additional Requirements
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI
DNR BRRTS Activity #: 02-38-580694

Dear Mr. Danko and Mr. Wahl:

On April 23, 2021 the Wisconsin Department of Natural Resources (DNR) received the *Air Pathway Site Investigation Work Plan* (“Work Plan”) for the above-referenced site that was submitted by Arcadis U.S., Inc. (Arcadis), on behalf of Johnson Controls, Inc. and Tyco Fire Products LP (JCI/Tyco). The Work Plan was accompanied by the appropriate fee of \$700, required under Wisconsin Administrative Code (Wis. Adm. Code) § NR 749.04(1) for formal DNR review and response.

JCI/Tyco’s evaluation of the migration of polyfluoroalkyl substances (PFAS) in air from the site is needed to determine the degree and extent of contamination (Wis. Adm. Code § NR 716.11(3)(a)), especially as it relates to proximal contaminated locations that may be reasonably explained via the air migration pathway (Wis. Adm. Code § NR 716.11(5)(a)), and to evaluate if air migration contributes to an on-going discharge of PFAS to the environment that must be controlled (Wis. Adm. Code § NR 716.11(3)(b)).

The DNR reviewed JCI/Tyco’s Work Plan to further investigate the potential air migration pathway of PFAS from the site. JCI/Tyco has proposed a phased approach to the investigation that will initially focus on shallow soil sampling. The DNR finds that JCI/Tyco’s proposed scope of work is designed to investigate historical deposition of PFAS in the surface soil on the property and will not effectively evaluate the potential on-going discharge of PFAS into the environment via the air migration pathway. The DNR approves JCI/Tyco’s phased approach to the investigation; however, additional lines of evidence will be needed to meet the requirements of Wis. Adm. Code §§ NR 716.11(3), NR 716.11(4) and NR 716.11(5). Because some lines of evidence would be strengthened if collected and evaluated together with the proposed soil samples, JCI/Tyco must add certain items into the upcoming field investigation and documentation report, which are summarized in this letter. Additional off-site sampling will be required in future work.

Background

JCI/Tyco is investigating and responding to the discharge of PFAS to the environment at the JCI/Tyco Fire Technology Center (FTC), located at 2700 Industrial Parkway South in Marinette, Wisconsin (the “Site”). The discharge occurred as the result of fire suppressant training, testing, research and development of PFAS-containing aqueous film forming foams (AFFF) at the Site that started in the early 1960s.

In accordance with Wis. Adm. Code § NR 716.11(5)(a), JCI/Tyco is required to evaluate all potential pathways for migration of contamination during the site investigation. Airborne migration of PFAS is considered a potential pathway from the FTC site because of the historical and on-going activities at the Site. These activities include, but are not limited to: fire testing, training and demonstrations of AFFF at the Outdoor Testing Area (OTA) from the early 1960s through 2017; AFFF performance testing at the outdoor Hydraulics Lab from 1985 to 2017; fire testing of AFFF in fire test houses from circa 1970 to present; and small-scale fire testing of AFFF in the Engineering Laboratory building since the 1960s.

On February 19, 2020, the DNR directed JCI/Tyco to submit an air pathway site investigation work plan for the Site by April 20, 2020. On October 12, 2020, JCI/Tyco submitted an *Aerial Deposition Evaluation Report* and concluded that investigation of the air migration pathway for PFAS from the Site was not needed. The DNR reviewed JCI/Tyco's report and responded in a letter dated February 23, 2021. In the letter the DNR identified five primary data gaps that JCI/Tyco must address in its investigation into the potential air migration pathway for PFAS from the Site.

JCI/Tyco's Air Pathway Site Investigation Work Plan

In its Work Plan, JCI/Tyco summarized plans to address the five data gaps through sampling and additional documentation, evaluation and research. JCI/Tyco's proposed scope of work for the five data gaps included:

- ***Aerial Discharge Mechanisms:*** Provide details¹ on Site-specific operations and findings from review of scientific research on the potential aerial discharge mechanisms of PFAS from AFFF testing sites.
- ***PFAS Signature:*** Include a PFAS signature analysis based on laboratory reporting for 36 PFAS compounds that will look for relevant composition markers that characterize historical AFFF use at the Site.
- ***Soil Sampling to Assess Aerial Deposition:*** Collect soil samples from the upper 6 inches of soil at 52 locations spanning approximately 350 acres on the FTC property (~ one sample/6 acres). Soil samples will be from undisturbed areas not previously sampled for PFAS and outside of the extent of wetlands (primarily wooded with deciduous trees). Samples are to be analyzed using Modified U.S. EPA Method 537 for 36 PFAS compounds and results evaluated using a statistical approach selected based on the normality of the data. The evaluation will look for patterns or correlations in the results to draw conclusions on potential airborne deposition of PFAS.
- ***Groundwater Sampling to Assess Aerial Deposition:*** If soil sampling indicates the air migration pathway has contributed to PFAS contamination off the FTC property, then collect shallow groundwater samples from permanent NR 141 monitoring wells screened 2 to 3 feet below the water table and constructed in area(s) upgradient of the current extent of the groundwater contaminant plume. (No groundwater sampling is proposed for this phase of work and is reserved for future phases of work based on finding and conclusions from soil sampling).
- ***Air Modeling Inputs:*** Provide documentation of air modeling in the air pathway site investigation report.

JCI/Tyco plans to provide a report summarizing the results within 8 weeks of receipt and validation of the laboratory data. The report will respond to each of the five data gaps previously identified by DNR and share recommendations for further action, if needed.

¹ Details that JCI/Tyco proposed include: (1) Review of published literature on PFAS transformation, volatilization, and aerial deposition; (2) descriptions of AFFF characteristics and behavior when used in testing; (3) duration, temperature, and fire behaviors for tests performed at the FTC; (4) historical records on indoor and outdoor testing, AFFF use, and building conditions at FTC; and (5) other potential PFAS emissions in the vicinity of the FTC Site.

DNR Review and Response

The DNR reviewed JCI/Tyco's Work Plan, which presented a phased approach to investigate the air migration pathway. The Work Plan provides an opportunity to evaluate data and expand the investigation in the future based on the conclusions and as there are advancements in the science and laboratory analytical methods for PFAS. JCI/Tyco's proposed scope of work uses surface soil sampling on the FTC property as the primary line of evidence to investigate historical aerial deposition of PFAS from the Site. No sampling of other media or off-site sampling is planned for this initial phase and no air sampling is proposed to evaluate the potential on-going discharge of PFAS into the environment via the air migration pathway.

The DNR approves using a phased approach to investigate the air migration pathway; however, additional sampling and lines of evidence than proposed as the first phase in the Work Plan, will be needed to meet the requirements of Wis. Adm. Code §§ NR 716.11(3), NR 716.11(4) and NR 716.11(5). Because some lines of evidence would be strengthened if collected and evaluated together with the proposed soil samples, JCI/Tyco must incorporate the following items into the upcoming work to demonstrate progress in meeting the requirements of Wis. Adm. Code §§ NR 716.11(3), NR 716.11(4) and NR 716.11(5). Additional off-site sampling will be required in future phases of the investigation.

Field Investigation Additions to Assess Aerial Deposition:

- ***Soil Sampling– Wetland Areas:*** Collect shallow soil samples in wetland areas. JCI/Tyco's assumption that groundwater and surface water interactions may influence the soil sampling results in these areas is reasonable, but it should not preclude sampling in these areas, especially since they represent a significant area of the property that are within the regional wind flow directions. If JCI/Tyco is concerned that surface and groundwater interactions will affect results from these soils, then the DNR recommends that JCI/Tyco categorize any samples taken from wetlands separately and evaluate if patterns in the results from the wetlands are consistent or different from samples collected from non-wetland areas in the investigation.
- ***Soil Sampling – Multiple Horizons:*** Collect distinct samples from at least the A (topsoil) and B (subsoil) soil horizons in all, or a subset, of the sample locations. Use the data to evaluate migration and retention of PFAS in different soil horizon layers having different organic carbon and geochemical conditions.
- ***Groundwater Sampling:*** Install NR 141 monitoring wells in at least three locations west of Ditch A on the FTC property and collect groundwater samples for PFAS from these wells during the upcoming field work. JCI/Tyco may construct shallow wells near the water table as proposed in the Work Plan.

* Note: Areas west of Ditch A have not been characterized for PFAS in groundwater, and this will remain a deficiency in the overall site investigation until testing is complete. For purposes of the overall site investigation deeper monitoring wells at various depth intervals will also be required at locations to evaluate potential migration pathways west of Ditch A (Wis. Adm. Code § NR 716.11(5)(a)). Installing additional wells now will support the overall site investigation.

Documentation Report Additions to Assess Aerial Deposition:

- ***PFAS Signature Analysis:*** Discuss how known or potential fate and transport processes may affect the PFAS signature if AFFF is mobilized in air (e.g., volatiles, particulates, aerosols) and deposited on the surface through various mechanisms at the FTC site.
- ***Evaluation of Soil Sampling Results to Assess Aerial Deposition:*** The DNR cannot comment on the data analysis because JCI/Tyco proposed to select a statistical approach after the field sampling results are

received. Therefore, JCI/Tyco must address the following items in its documentation report (Wis. Adm. Code §§ NR 716.11(3) and NR 716.11(5)):

- Include the hypotheses to be tested and the basis for selection of the statistical analysis.
- Address the following questions or areas of uncertainty:
 - How do potential microheterogeneities in soil concentration influence findings and conclusions from these discrete soil samples?
 - How may leaching or retention of PFAS in the soil following historical aerial deposition influence results?
 - How may the vegetation/tree cover in the sampling area affect the results? Address their potential influence on deposition from air and their potential uptake of PFAS from soil?
- Include figures showing concentrations contours for PFAS detected in the soil other than perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). In particular, provide concentrations of precursor compounds when detected.
- Provide specific criteria used to derive whether the PFAS detected in soil may be contributing to PFAS detected in groundwater.
- Further assess background concentrations of PFAS in soil at sites in similar settings and comment on whether Site-specific background concentrations through testing in this area are needed.
- **Air Modeling:** If available, include records on fire training dates, times, weather conditions (wind speed, wind direction, temperature), which may better predict potential air migration pathways from these discrete events. Discuss how use of discrete weather conditions as compared to long-term regional averages may affect modeling results.

Conclusions and Next Steps

The DNR finds JCI/Tyco's phased approach that starts with shallow soil sampling to look for patterns of historical aerial deposition on the FTC property to be reasonable, but additional sampling and lines of evidence will be needed to meet the requirements of Wis. Adm. Code §§ NR 716.11(3), NR 716.11(4) and NR 716.11(5). The next steps required by JCI/Tyco for the Site are summarized below. JCI/Tyco's responses can be incorporated in the documentation report; additional written response to this letter is not needed.

- Within **60 days** of receipt of this letter, implement the field investigation in the Work Plan (Wis. Adm. Code § NR 716.11(2r)) with the additions listed above. Complete the sampling in accordance with the final QAPP dated March 2021.
- Within **60 days** of receipt of the final laboratory report, submit the documentation report proposed in the Work Plan with the additions listed above and the two requirements listed below (Wis. Adm. Code § NR 716.15)).²
 - Documentation of management of investigative derived waste (Wis. Adm. Code § NR 716.11(6)).
 - Conclusions and recommendations for next steps, including schedule for next phase of work.

As a reminder, this Site is subject to an enforcement action and therefore all submittals to the DNR under Wis. Adm. Code chs. NR 700-799 and submittals directed by the DNR must be accompanied by an Wis. Adm. Code

² The 10-day data notification to the DNR per Wis. Adm. Code § NR 716.14 (2) is not required if JCI/Tyco continues to provide the biweekly updates to the database when the results becomes available and provides the documentation report within 60-days of receipt of the data (Wis. Adm. Code § 716.14(3)). The requirement of 10-day data notification of results to landowners (with copy to DNR) remains in effect for samples collected on property that is not owned by JCI/Tyco.

ch. NR 749 fee per Wis. Stat. § 292.94. These fees are not pro-ratable or refundable per Wis. Adm. 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.

The DNR appreciates your efforts to investigate and remediate this Site. If you have any questions about this letter, please contact me, the DNR Project Manager, at (608) 622-8606 or Alyssa.Sellwood@wisconsin.gov.

Sincerely,

A handwritten signature in cursive script that reads "Alyssa Sellwood".

Alyssa Sellwood, PE
Complex Sites Project Manager
Remediation & Redevelopment Program

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