

# Army Study Underestimates Risk to Groundwater and Public Health

Recommendations and Comments on the November 2019  
Draft Final Remedial Investigation/Feasibility Study (RI/FS) for  
Site-Wide Groundwater at the Former Badger Army Ammunition Plant

by

**Citizens for Safe Water Around Badger (CSWAB)**

January 21, 2020

## BACKGROUND

The Army's preferred alternative or remedy for groundwater contamination at and near Badger Army Ammunition Plant will be presented in a separate document called the Proposed Plan. This remedy will be based on the results of the [Remedial Investigation/Feasibility Study](#) (RI/FS) – the subject of these comments. The Proposed Plan will identify the groundwater remedy preferred by the Army. The Army will submit the Proposed Plan to the regulatory agencies and then the public for review. After this review, the Army will release a Decision Document that identifies its selected remedy, certifies that the selection process was carried out in accordance with CERCLA (Superfund law), and addresses public comments on the Proposed Plan.

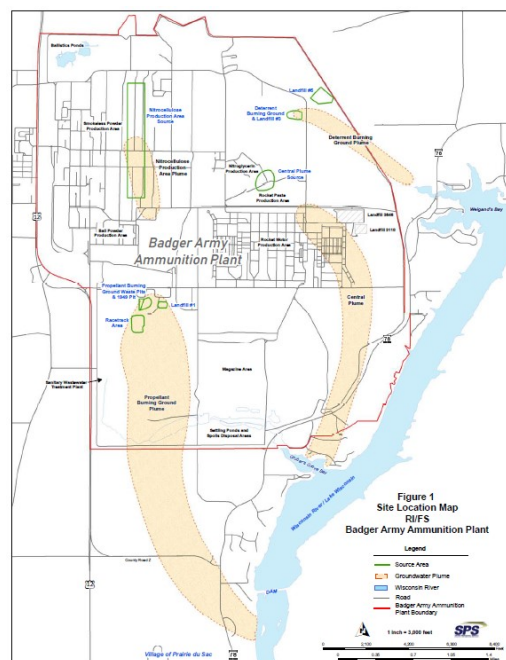
## SUMMARY OF COMMENTS ON RI/FS

As part of its calculation of risk, the Army proposes an arbitrary distinction between onsite and offsite groundwater. When making its risk management decisions, the Army said it considered a cumulative cancer risk above  $1 \times 10^{-6}$  (one in a million) for offsite groundwater and a less protective  $1 \times 10^{-4}$  (one in ten thousand) risk for onsite groundwater.

However, the aquifers under and around Badger function as unified hydrogeological units and groundwater is not a static system. Contaminants found at source areas inside Badger will eventually move with prevailing groundwater flows to the surrounding community, unimpeded by the Army's barbed-wire fence.

For two of the four groundwater contaminant plumes originating from Badger, the Army included only one form (isomer) of the explosive DNT (2,6-DNT) in its health risk calculations however, all six isomers of DNT are present in groundwater.

This omission is significant as toxicological studies indicate that when both 2,4-DNT and 2,6-DNT are present, their combined ability to increase cancer risk is more than just additive, and may be



synergistic or multiplicative, according to state health officials. The federal EPA cancer slope factor for mixtures of 2,4- and 2,6-DNT takes into account this effect and results in an even more protective concentration than either isomer individually or added together.

Also missing in the Army study are DNT break-down products, actual soil data for all forms of DNT and the pending PFAS investigation.

## RECOMMENDATIONS

### 1. Private Well Testing at and near the Propellant Burning Ground Plume

The groundwater pump-and-treat system at the southern boundary of Badger was installed and operated to prevent the migration of contaminants beyond the property boundary. Now that the system has been shut down, this protective barrier is gone and contaminant movement is no longer inhibited. Further, we disagree with the Army's reliance on sampling conducted prior the cessation of active groundwater remediation, particularly in light of the significant increases in groundwater contaminant levels at the Propellant Burning Grounds and exceedances at the southern plant boundary including ethyl ether.

**We ask that the Army be required to regularly test down-gradient drinking water wells located in or near estimated plume margins which – despite the tidy maps in the RI/FS – are not static.**

### 2. PFAS Investigations & Testing

The Army has indicated that the pending Preliminary Assessment/Site Investigation (PA/SI) for PFAS at Badger may be limited to only PFOA and PFOS.

- a) **We strongly support the Wisconsin Department of Natural Resources (WDNR) [request](#) that the PA/SI evaluate all 36 PFAS compounds** for which the Department has requested drinking water standards. We recognize that the 2018 sampling effort by the Army did not include all of these but did include 18 compounds.
- b) **We also ask that the RI/FS not be finalized until the PA/SI has been submitted to and formally reviewed by the WDNR** for completeness and consistency with non-military site investigations in Wisconsin.
- c) In September 2018, area residents collectively asked that the U.S. Army prioritize public and private well testing in its planned investigation for PFAS – a group of highly toxic compounds that has not been included in any of the Army's previous environmental studies. More than 100 people, including members of the community's Restoration Advisory Board, signed a [resolution](#) asking that the Army test all public drinking water systems within a four-mile radius of Badger for PFAS. The resolution also asked that the Army include PFAS analysis in its upcoming testing of approximately 300 residential wells near the former military base.

**This testing should be completed before any remedy selection begins.**

- d) In addition to firefighting foam, PFAS have been found in solid waste, landfills and surrounding environmental media (soil, groundwater), leachates, landfill gas, wastewater effluents, and biosolids. A scientific [study](#) of U.S. municipal landfill leachate detected PFAS in over 50% of the landfills tested. As the majority of land disposal sites at Badger are unlined and without leachate collection systems, any PFAS present will inevitably migrate off-site with the potential to contaminate groundwater. PFAS are highly soluble and do not degrade in the environment.

**The RI/FS for groundwater should be amended to include PFAS testing at all 10 landfills and other pertinent land disposal sites at Badger.**

### 3. Aesthetic water quality

The Army has and proposes to replace impacted residential well replacement with deeper wells which invariably have very poor aesthetic quality. Water from these wells is often heavy in iron concentrations requiring household treatment for the life of the well, long after active remediation is complete. **The RI/FS should indicate how residents will be compensated in this regard.**

### 4. Contaminants of Concern

- a) The Wisconsin River acts as a discharge point for groundwater east and south of Badger. Based on historical groundwater sampling data, groundwater is contaminated by chlorinated solvents and explosives from the Propellant Burning Grounds. The RI/FS states: "While other contaminants of concern were detected, it is unlikely these contaminants are site related."

**The RI/FS should be amended to list ALL detected contaminants of concern in groundwater at Badger and the range of concentrations (minimum and maximum) for each. This request includes (but is not limited to) vanadium, tetrahydrofuran, nitrates, pesticides/herbicides, PFAS, PCBs, dioxins and asbestos.**

- b) EPA estimates that 90% of 1,4-dioxane produced was for use as a stabilizer for chlorinated solvents including 1,1,1-TCA and carbon tetrachloride. **The RI/FS should address the potential for solvent stabilizers to be present at Badger.**

### 5. DNT – A Mixture of 6 Isomers

According to the RI/FS (page 5), remedy Alternative 3 (Pump and Treat), Alternative 4 (Anaerobic Bioremediation) and Alternative 6 (Source Area Treatment) for the Propellant Burning Ground groundwater contaminant plume will target elevated levels of only one form of DNT (2,6-DNT). However, all six forms of DNT (2,4-, 2,6-, 2,3-, 2,5-, 3,4- and 3,5-DNT) have been detected in groundwater at Badger.

Similarly, the calculation of cumulative cancer and non-cancer risk is limited to only 2,6-DNT at the Propellant Burning Ground (off-site and on-site) and the Central Plume (off-site) – which are both impacting neighboring residential areas.

This is a significant omission as degradation of identified contaminants of concern is a significant consideration in the majority of proposed alternative remedies and the minor forms of DNT do NOT biologically or chemically degrade. In fact, the [Army](#) evaluated the groundwater capture of the MIRM (groundwater pump-and-treat system) by tracking 2,3-DNT because it was “more persistent and could be used as an indicator within the entire PBG plume whereas the 2,4- and 2,6- were only being detected in the source area.”

Moreover, consideration of all six isomers is necessary to be consistent with Wisconsin’s Groundwater Enforcement Standard of 0.05 ug/l for the **summed total** concentration of all six DNT isomers.

**Therefore we ask that all six isomers of DNT are included as Contaminants of Concern in groundwater both inside and outside the facility.**

## 6. Total Mass of DNT in Source Areas

The Army’s calculation of the remaining total mass of residual DNT contamination in the plume source areas is based on soil data for only two of the six isomers present at Badger. As a result, the remaining mass of total DNT is significantly underestimated.

Moreover, actual field data is necessary to accurately quantify and substantiate the estimated risk to human health and the environment.

**The WDNR previously [ordered](#) and then [deferred](#) soil testing for all forms of DNT pending action by EPA nearly 10 years ago and is no longer relevant. WDNR should now reinstate its order to the Army to test (fully characterize) contaminated soils in plume source areas for all six forms of DNT.**

## 7. Vapor Intrusion

**The Army’s evaluation of vapor intrusion as a potential route of exposure should be amended to include degradation products of DNTs.** [Scientific studies](#) indicate that *o*-nitrotoluene (2-nitrotoluene; CAS 88722), for example, is sufficiently toxic and volatile to be considered a [vapor intrusion](#) threat.

## 8. Surface water, natural springs and wetlands

The Clean Water Act, 33 U.S.C. ss 1251 et seq., was enacted by Congress to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” Id. ss 1251(a). Wisconsin has an EPA-approved NPDES permitting program, and the WDNR is the agency that issues NPDES permits to point-source dischargers within the State. For this reason, Wisconsin issued WPDES permits containing effluent limitations for the discharge of treated groundwater from the IRM/MIRM to Lake Wisconsin.

In comments on the previous RI/FS for groundwater, the WDNR noted that one possible concern about [contaminated groundwater seeping](#) into Lake Wisconsin/Wisconsin River might be for carbon tetrachloride, particularly at the groundwater/surface water interface.

Enforceable limitations will also help assure that the discharge of contaminated groundwater to spring-fed wetlands at Weigand’s Bay does not negatively impact this aquatic ecosystem and

fisheries. The same recommendation applies to groundwater discharge to the Lower Wisconsin Riverway through “seeps” in the river bank.

Given the State has not enforcement groundwater standards outside the Badger property literally for decades, the public cannot rely on this mechanism alone to protect aquatic ecosystems.

**Therefore, we ask that the State apply the SAME effluent limitations required for the IRM/MIRM discharge to the discharge of contaminated groundwater to all surface water, natural springs and wetlands near Badger.**

## **9. Soils as a Source of Groundwater Contamination**

The presented alternative remedies are limited to groundwater primarily because the Army maintains that contaminated soils in source areas have been addressed “to the maximum extent possible” and that the WDNR has issued site closure for soil cleanup.

However, these regulatory approvals are contingent on the ability of the remedy to protect human health and the environment by achieving compliance with state and federal standards and all specific conditions outlined in closure documents.

**Therefore, we ask that the WDNR formally review current site conditions and make a determination as to whether or not compliance with source area closure conditions (for soil) at Badger are currently and fully achieved.** If not compliant, we ask that the WDNR require the Army to complete an RI/FS (or equivalent) examining technologies and methods that could improve the control of source areas.

### **NOTATION:**

These comments may be amended as new information is made available by the Army. To date, a public comment deadline has not been set Groundwater RI/FS for Badger Army Ammunition Plant.

### **Submitted by:**

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