

Comments
**Draft Revised Remediation Goals Proposal for the Alternative Feasibility Study Final
Creek, Settling Ponds, and Spoils Disposal Areas
Badger Army Ammunition Plant**

**Prepared by Environmental Stewardship Concepts
For the Badger Army Ammunition Plant Restoration Advisory Board**

February 4, 2010

Executive Summary

The U.S. Army has proposed revising previously-approved soil cleanup goals for certain areas inside Badger Army Ammunition Plant (Badger). Earlier Army studies determined that exposure to soil contaminants at Final Creek, the Settling Ponds, and Spoils Disposal Areas poses an unacceptable risk to human health. In order to minimize these risks, the Army has proposed several approaches that rely on limiting or prohibiting certain land uses such as camping and makes certain assumptions about land use and populations at risk. These assumptions may not be realistic or appropriate and as a result, proposed methods could underestimate actual risks to human health. The proposed revisions may have implications beyond the remediation of the Settling Ponds at Badger.

Introduction

The initial remediation goals at Badger were proposed in 1994 by the U.S. Army and accepted in 1995 by the Wisconsin Department of Natural Resources (WDNR), U.S. Environmental Protection Agency (EPA), and members of the Badger Restoration Advisory Board (RAB).

This current proposal, *Draft Revised Remediation Goals for the Alternative Feasibility Study Final Creek, Settling Ponds and Spoils Disposal Areas*, is meant to incorporate new toxicological data, soil and ground water data, land use and information about exposure pathways to establish remediation goals that are protective of human health and the environment. The Proposal states that these remediation goals were developed using NR720. NR720 is Wisconsin's state law establishing soil cleanup standards for the remediation of soil contamination. The new information may impact the default values, exposure assumptions, and proposed methodology used to derive site-specific residual contaminant levels at the Badger Army Ammunition Plant (the Site). When the remedial goals are in place, the Army can continue with the alternative feasibility study.

These comments were prepared to address cleanup at the Settling Ponds, though the proposal and methodology apply to all five target areas of concern. There are five target areas of concern at the Site; the Settling Ponds and Spoils Disposal Areas is one of them. This area is comprised of Final Creek, four Settling Ponds, and five Spoils Disposal Areas, covering approximately 70 acres. Parcel M1 is made up of Settling Ponds 2, 3, and a portion of Settling

Pond 4, Spoils Disposal areas I, II, III, IV, and V. The other portion of Settling Pond 4 was cleared for closure in 2008.

The WDNR and the National Park Service will take over parcel M1 when the remediation is complete. Parcels T and T1 will be transferred to the Bluffview Sanitary District because they contain the Wastewater Treatment Plant servicing Bluffview.

General Comments

1. The Army does not adequately justify proposed remediation goals.

The proposed preliminary remediation goals are presented for seven chemicals in Table 2 of the Draft Proposal document. When looking at Table 2 in the document, it seems that the Army “cherry-picked” the cleanup values from amongst the different sources because no explanation is given for why the remediation goals come from such a wide range of sources.

2. The document does not include a comparison of the original cleanup goals to the recently proposed goals and the reasoning for the differences in the cleanup standard.

The table below compares the chemicals and cleanup standards proposed in this most recent proposal to the original chemicals and cleanup standards from the *1994 Feasibility Study*. It is unclear why the limits from the *Approval of Corrective Measures* were so much lower than those proposed in the Remediation Goals Proposal. The Army should explain how the basis for the remediation goals has changed such that less protective standards are now acceptable.

Chemical	1995 Approved Remediation Goals for surface soils at Final Creek and Settling Ponds* ppm	2010 Proposed Remediation Goals for soil ppm**
Aluminum (Al)	19	-
Arsenic (As)	-	10
Carcinogenic Polyaromatic Hydrocarbons (cPAHs)	0.4	-
Chromium (Cr)	-	35.5
Diethyl phthalate (DEP)	20	-
Diphenylamine (DPA)	3.5	-
Lead (Pb)	30	500
Mercury (Hg)	-	-
Tin (Sn)	10	610,000
2,4-DNT	2.5	25.7
2,6-DNT	4.29	620
Nitroglycerin	3.6	62

* From the Army's *Approval of Corrective Measures Selected in the Final Feasibility Study Report/Corrective Measures Study Report for the Badger Army Ammunition Plant*, dated June 1, 1995. Original data from Tables 6-6 and 6-7 of the August 1994 *Final Feasibility Study*.

*** From the Army's Draft Revised Remediation Goals for the Alternative Feasibility Study Final Creek, Settling Ponds and Spoils Disposal Areas
(-) The empty cells indicate chemical not proposed.*

3. The Army introduced the issue of land use classification for Badger but does not reference any zoning laws, guidance or documents applicable to this site.

The best comprehensive, multi-stakeholder document available on future land use at Badger is the Badger Reuse Plan. The Badger Reuse Plan was completed in 2001 to address the various positions of citizens, government officials and interest groups on the eventual reuse of Badger.

The Badger Reuse Committee was organized with assistance from U.S. Congresswoman Tammy Baldwin and funding from the U.S. Department of Labor to create the Badger Reuse Plan. The participants were selected to represent the variety of interests and stakeholders impacted by the cleanup and reuse of Badger. The Committee was comprised of:

- Representatives from the Wisconsin Department of Natural Resources, the Wisconsin Department of Administration, and the Governor's office
- Seven members of local government including the Town of Sumpter
- Representatives from the US Department of the Interior (National Park Service) and the US Department of Agriculture (Dairy Forage Research Center)
- One representative of tribal government (Ho-Chunk Nation)
- Representatives of local business interests
- Local landowners
- Two representatives of historical, cultural and education interests, and
- Representatives for environmental and conservation interests.

The National Park Service/WDNR, USDA Dairy Forage Research Center and Bluffview Sanitary District in the Town of Sumpter will each be future landowners following the remediation at Badger. As such, their reuse objectives should be incorporated into the Army's plan for remediation.

4. Based on available guidance and regulations, the Army's land use assumptions may not be realistic or appropriate.

The introduction states that the updated site-specific goals were developed using Section NR720 720.19 of the Wisconsin Administrative Code and the Remediation Goals Proposal recommends using the industrial residual contaminant levels from Table 2 of NR720, but there are more sections of NR720 that are relevant to this cleanup. The Army never explicitly states that the land is classified for industrial use or that there will be industrial use of the total acreage of all five areas at the site (with the exception of the wastewater treatment plant) in the future. Moreover, the Army fails to take into account several sections of NR720 that would indicate that Badger should not be considered as an industrial site. The Army's usage of NR720 to justify the remediation goals at the site is selective and does not consider the entire body of information outlined in the law. Furthermore, the proposal to classify Badger as an industrial site goes in direct contrast to the majority of the values outlined by the Badger Reuse Committee in the Badger Army Ammunition Plant Reuse Plan.

5. Classifying the site as Industrial may not be consistent with state law and guidance from the Badger Reuse Committee.

Wisconsin regulation NR720 and Badger Reuse Plan set out specific criteria for human health and the environment. It is clear, when comparing the statutes of NR720, the values of the Badger Reuse Plan, and the remediation goals outlined in the Army's proposal, that an industrial listing for the Badger Plant may not be correct. Listing Badger as an industrial land use is incongruent with the values outlined in the Badger Reuse Plan as well as NR720.

6. The Proposal lacks any discussion about land use controls that will have to be implemented if portions of Badger are zoned Industrial.

The Remediation Goals Proposal does not include a section that directly addresses which land use controls may be put into place following the remediation. Land use controls are put into place to ensure the safety of human populations that may come into contact with the site during work or recreational activities, once remediation is complete. Land use controls at Badger could include: restrictions on hunting (if the animals are eating contaminated grass and present a threat to the human food chain), restrictions on grazing/agriculture, fences, deed restrictions, and limited access. The number of land use controls is directly related to the standard of cleanup at the site. It is possible for the Army to remediate the site to the point that hunting would be allowed and almost anything but residential use would be acceptable. However, this is not likely to happen if the site is classified as industrial.

7. The Remediation Goals Proposal omits reference to the human food chain.

Specifically, NR720 720.07 (1)(2)(c)3 states that a soil cleanup standard developed under this chapter shall comply with the following requirements: Residual soil contamination at the site or facility shall not concentrate through plant uptake and adversely affect the food chain...Responsible parties are *required* by ss. NR720 720.07(2) and 720.19(6) to consider human food chain exposures, the protection of surface water quality and the protection of terrestrial ecosystems, if these pathways are of concern, when determining a residual contaminant level at a site or facility" (emphasis added).

At the Badger site, the aforementioned pathways are of concern, but the Remediation Goals Proposal never mentions the human food chain or the variety of uses of Badger. First, the site is routinely used by children, students, and interns during prairie restoration and U.S. Dairy Forage Research Center activities. These populations do not fall under the same categories as industrial or construction workers, and children are scientifically proven to be more vulnerable to environmental pollution than adults. Thus, the same standards do not apply. Second, hunting for game animals is a common source of food for populations around Badger. Game animals are known to use Badger for habitat. Uptake of contaminants by the plants on-site may directly affect the food chain and could be indirectly transferred to humans during consumption of these animals. Thirdly, agricultural use of the site will present another potential category of exposure. If crops are grown on Badger property for the purpose of dairy cattle feed, it is possible that certain site contaminants could concentrate through plant uptake and enter the human food chain. The Army, in addition, should include a list of current and future uses of the Badger site

in the Remediation Goals Proposal so as to present a logical and balanced look at how the land might be classified.

8. More stringent residual contaminant levels for soil are necessary to protect public health on and off-site.

The Army's classification of Badger is not correct on the basis of another section of NR720 and the Badger Reuse Plan. NR720.11 addresses how responsible parties shall determine appropriate land use classification. Specifically, it states that responsible parties shall classify the land use of a site or facility as non-industrial unless it meets three criteria. Badger does not meet the third criterion¹, on the basis that the variety of uses for Badger includes: two forms of human food chain pathways (hunting and agriculture/grazing); vulnerable populations interacting with the soil; education; conservation; and recreation. In addition, there are residential neighborhoods located in close proximity to the site.

9. The Proposal indicates that the Army is considering a less protective cancer risk than the one established by WDNR.

In NR720, WDNR established a cancer risk level of 10^{-6} . As a result, the Army should follow the law and use a cancer risk level of 10^{-6} , which means one in one million people would be expected to get cancer. However, the Proposal states: "...Setting remedial goals at the WDNR standard one in 1,000,000 [10^{-6}] risk level for some contaminants of concern could be impracticable" (4). The higher the concentrations of contaminated soil left at Badger, the higher the odds are of getting cancer – therefore, accepting a risk level of 10^{-4} would leave 100 times more contamination in the soil after the cleanup is complete.

10. The Proposal omits reference to cumulative risk and the effects of chemical mixtures.

NR720.11 (3) indicates cumulative excess cancer risk for multiple chemicals cannot exceed 1×10^{-5} and that the hazard index for non-carcinogens cannot exceed one for the contaminants of concern at a site. In other words, the Army's proposed remediation goals for each contaminant of concern at Badger must be protective of human health such that these levels are not exceeded. The same section of NR720 also addresses chemical mixtures, stating that "the risks for carcinogens and non-carcinogens are presumed to be additive within each category." The Proposal does not discuss cumulative risk and how the proposed remediation goals would meet the requirements set out in NR720 and protect human health.

11. It is unclear whether the Army considered the revised dermal contact exposure pathways.

The Army's proposed remediation goals are based, in part, on Table 2 of NR720. Under Table 2 of NR720, there is a note that states: "The residual contaminant levels in Table 2 are based on protection of human health from direct contact through ingestion of soil or inhalation of particulate matter. *These concentrations of hazardous substances in soil may*

¹ NR720.11 (1) (b) 3 Criterion 3: "More stringent residual contaminant levels for soil are not necessary to protect public health on or off the site or facility. Note: Situations where s. NR720.11 (1) (b) 3. would apply include site or facilities which could otherwise be classified as industrial, but where proximity to a nonindustrial land use, such as residential housing located across the street, makes a nonindustrial classification more appropriate."

not be protective of other pathways of concern (emphasis added). The definition of direct contact will be expanded in future revisions to include human exposures by inhalation of vapors and dermal absorption.” It is unclear in the Remediation Goals Proposal whether the Army has considered that these revisions may impact the way in which the remediation continues. Dermal absorption is a pathway that the Army cannot overlook in the case of Badger, given the current and future uses and the populations that interact with the soil (namely, children). As a result, it is unclear whether the value listed for lead will remain applicable in the future or will have to be revised. We recommend that the Army take these other pathways into consideration so as to prevent having to return to the site for a second round of remediation.

12. The Proposal does not explain why the Army did not collect soil samples for all six isomers of DNT.

There are six isomers of DNT, and the Army only collected data for two. The other four may be in the soil and may pose a risk to human health. There is no explanation in the Proposal for why the contaminants of concern do not include the other four isomers of DNT and how the site will be suitable for human use if it is unknown which chemicals could remain after cleanup.

13. The Remediation Goals Proposal disregards community concerns and desires articulated in the Badger Reuse Plan.

The Army’s proposal to classify Badger an industrial site goes in direct contrast to six of the nine stated values listed in the Badger Reuse Plan. As such, the Army is opposing the stated reuse priorities of the community, the local government and the federal government concerning the remediation at Badger. The list below contains a description of principles and criteria for each the values that preclude an industrial classification, based on those outlined in the Reuse Plan. It is evident that the Reuse Committee values education, conservation, recreation, tourism, agriculture, public health and sustainability. The values never mention industry and in fact, explicitly state that commercial development should be prohibited.

- **Value 2** directs the federal government to complete the highest quality cleanup of the Badger property in a timely manner with unwanted buildings removed. **Criteria:** The Army and federal government will retain liability for cleanup; the federal government will cover the costs of any buildings removed; the final cleanup level should not pose any hazard to human or environmental health; future uses should maintain the final cleanup level and not threaten additional contamination; cleanup activities should provide educational and research opportunities; preserve materials with historical value and recycle unwanted materials.
- **Value 4** emphasizes the desire to reuse the Badger property in a way that contributes to reconciliation and the resolution of past conflicts. **Criteria:** Educational facilities should be established; recognition of historically significant places should be recognized in situ; community contributions to wars should be memorialized.

- **Value 5** recognizes the great potential of the Badger property to provide educational, research, and recreational opportunities. **Criteria:** Educational opportunities should be made available to all people; Badger’s natural and cultural features should be preserved in conjunction with these opportunities; activities should have a low-impact on the environment and be compatible with other uses.
- **Value 6** focuses on the role that sustainable agriculture opportunities can and should play in the reuse of the Badger property. **Criteria:** Integration of conservation and agriculture with other resources and activities; maintenance of public and wildlife access between the Wisconsin River and Baraboo Hills; focus research on conservation and restoration of the area; family farming interests included in agricultural opportunities at site; agricultural activities should be compatible with conservation and restoration goals; crops and grazing are the primary compatible agricultural opportunities.
- **Value 8** recognizes the importance of the Badger property in providing open space and protecting the characteristic rural landscape of our area. **Criteria:** no residential or commercial development.
- **Value 9** involves the need for future uses of the Badger property to contribute to economic stability and sustainability in our local municipalities. **Criteria:** maximize local economical benefits and minimize costs; emphasize Badger’s contribution to Sauk County’s tourism economy; future owners should contribute to cost of government services; transportation needs of future uses should be accommodated but should not interfere with values and criteria.

Specific Comments

1. Page 3, Land Use, paragraph 1: The text states: “Therefore, the exposure rate for this type of land use would be even less than an industrial setting.” NR720 distinguishes the classification of land use on far more factors than simply the exposure rate. NR720 states “The soil cleanup standard for the site is determined by selecting the lowest concentration from among the individual residual contaminant levels determined for each pathway.” The selected cleanup standard is required to comply with three standards: not impacting the human food chain, not impacting surface water and not impacting sensitive environments. This sentence oversimplifies the type of land use at Parcel M1.
2. Page 3, Established Limits, paragraph 1: The text lists the original remediation goals from 1995, but does not discuss the basis of these goals and why they are so much more conservative than the newly proposed goals. This text should include information about the proposed land use in 1995.
3. Page 3, Established Limits, paragraph 2: The concentration of 2,4-DNT in Final Creek is 120 times the EPA’s industrial soil screening level and 412.5 times the residential screening level. In the Spoils Disposal Area I, the screening values are exceeded 85.5 and 293.8 times, respectively. The Army’s basis for “limited exposure at the Site” is not fully credible, particularly when human health is at issue. The suggestion that these sites may not need to

be fully remediated to the EPA's levels is not supported and is not protective of human health during future use of the site.

4. Pages 3-4 Exposure Frequency, paragraph 1: The document states: "The WDNR exposure frequency value is 250 days per year per NR720. However, a worker would only be potentially exposed during working hours, which is eight hours out of a 24-hour day. If the number of days is adjusted based on actual exposure hours, the number of days is reduced from 250 to 83 days per year. This exposure rate is still considered conservative in that a worker at the WWTP would not likely be exposed to the soil outside the WWTP as part of their regular work-related duties." The assumption that the number of hours per day can be compacted into the number of days is not biologically accurate. Risks associated with shorter exposures over a longer period are different than those associated with intense, short-term exposures.
5. Page 4, first full paragraph: The Army should give the reference or explanation for its estimate of seven hours per day for recreational use.
6. Page 4, Cancer Risk: The first sentence of this section is all that it needs to establish the cancer risk level for Badger. The state has set a risk level and thus that should be the risk level to be achieved in this cleanup. The quote from the California Environmental Protection Agency seems out of place and not wholly relevant to the discussion of the cleanup at Badger. The report cites the "expansive area" of the site (70 acres) as the reason that using the WDNR standard (10^{-6}) for some contaminants of concern could be impracticable. However, the size of the site does not fall into the category of economic or technological considerations mentioned in the California EPA quote. The Army does not provide a convincing argument against using the cancer risk level established by WDNR, but NR720 indicates that using another cancer risk level is not an option.
7. Page 4, Ingestion Factor, paragraph 1: The hand-to-mouth transfer that is the primary means of soil ingestion is largely a habit of children. However, this paragraph does not mention children. This paragraph should be revised to include a statement about how children will be exposed to soil and the levels they are expected to ingest. The EPA Child-Specific Exposure Factors Handbook (2008) is the preferred source for determining risks to children.
8. Page 4-5, Ingestion Factor, paragraph 2: The Army cannot say with certainty that the vegetation will not be disturbed with future land use. If the site is to be converted to park land, who is to say that a bike or walking path will not be installed? A playground or bathroom facilities are also likely possibilities. Any of these activities will involve soil disruption.
9. Page 6, paragraph 1: The Army lists seven chemicals for which there will not be a remediation goal: 2n-nitrophenylamine, carcinogenic polycyclic aromatic hydrocarbons, diethyl phthalate, diphenylamine, nitrocellulose, aluminum, and zinc. There is no rationale

of why each specific chemical was ruled out. The sampling data for these chemicals should be given in this document so that it is clear to the reader which chemicals do not have cleanup standards and which do. The Army should also give a citation indicating where the soil concentration data for those below screening levels can be found. ESC recommends using a table similar to the one below to clearly represent these chemicals and the reasons they were not included in the remediation goals.

Chemical	Concentration below screening level? Yes/No Give sampled concentration.	Existence of regulatory cleanup standard? Yes/No	Citation of screening level or standard
X	X	X	X

ESC also developed the table below, which lists applicable screening levels for several of the chemicals. These cleanup standards are from both state and federal sources and could be used as standards in the remediation of these chemicals at Badger, if the concentrations warrant creating a remediation goal.

Contaminant	Guidance/Regulatory limit (mg/kg)	Source of guidance/regulation
Carcinogenic PAHs (benzo(a)pyrene)	2 (industrial land use soil values)	Washington State Soil Cleanup Levels for Industrial Land Use
	0.13 (commercial/industrial land use)	California Human Health Soil Screening Levels
	3.8E-02 (residential)	California Human Health Soil Screening Levels
	0.06	EPA Generic Soil** Screening Levels for residential scenario
Diethyl phthalate	550,000 (ingestion - dermal)	EPA Generic Soil** Screening Levels for outdoor worker receptor
	49,000 (ingestion-dermal)	EPA Generic Soil Screening Levels for residential scenario
	110	Washington state Sediment Impact Zone Maximum Level, WAC 173-204-420; and the Sediment Cleanup Screening Level/Minimum Cleanup Level, WAC 173-204-520*
Zinc	340,000 (ingestion-dermal for outdoor worker scenario)	EPA Generic Soil Screening Levels**
	23,000 (ingestion-dermal for residential scenario)	EPA Generic Soil Screening Levels**
	1.0E+05 (industrial/commercial use)	California Human Health Soil Screening Levels

	2.3E+04 for residential use	California Human Health Soil Screening Levels
--	-----------------------------	---

* Used as an upper regulatory level for source control and cleanup decision making

** These standards are not national standards, but they are meant to identify contaminants at a site that generally do not warrant federal attention; they are also meant to “focus the Remedial Investigation/Feasibility Study and the site risk assessment.” The EPA also considers the soil screening levels to be potentially suitable for use as remediation goals. With this in mind, the Army could take these values into account before continuing to state that there are not cleanup standards for these chemicals.

10. Page 6, paragraph 1: The Army should also give some explanation regarding the statement that 2n-nitrodiphenylamine is also “possibly 2-nitrodiphenylamine.”

List of Recommendations for the Army

- Explain how the basis for the remediation goals has changed since 1995 such that less protective standards are acceptable in the 2009 proposal. Give an explanation for each chemical for which the value has changed.
- Provide a table that compares the remediation goals for each contaminant from 1994 and the goals from 2009.
- Take into account NR720 720.07 (1)(2)(c)3, NR720 720.07(2), NR720 720.11, NR720 720.19(6) and the Badger Reuse Plan before deciding what land use classification to use at Badger.
- Explain how current and future site usage at Badger relates to the human food chain.
- Explain how the Army will incorporate State of Wisconsin’s revised definition of direct contact, which now includes human exposures by inhalation of vapors and dermal absorption.
- The Army lists seven chemicals for which there will not be a remediation goal: 2n-nitrophenylamine, carcinogenic polycyclic aromatic hydrocarbons, diethyl phthalate, diphenylamine, nitrocellulose, aluminum, and zinc. The Army should provide a detailed explanation of why each specific chemical was ruled out as a contaminant of concern.

These comments were prepared by Environmental Stewardship Concepts for the Badger Restoration Advisory Board (RAB) under Technical Assistance for Public Participation program (TAPP) from the Department of Defense (DoD). The RAB is comprised of citizens from the areas affected by the activities at Badger, formed to provide advice to the Army and regulators regarding the cleanup. TAPP funding is available to RABs to provide them with technical

assistance during contaminated site remediation. These comments do not represent the position of DoD, EPA, WDNR or any other entity. ESC is a private consulting firm providing technical services to communities (www.estewards.com).

Contact:

Dr. Peter deFur, President

pldefur@igc.org

(804) 741-2922