



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 1  
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BOSTON, MASSACHUSETTS 02114-2023

November 9, 2001

Mr John Burleson  
BRAC Environmental Coordinator  
Statford Army Engine Plant  
550 Main Street  
Stratford, CT 06497

Re Draft Remedial Investigation Work Plan  
Additional Groundwater Investigations  
Statford Army Engine Plant  
Stratford, Connecticut

Dear Mr Burleson.

The United States Environmental Protection Agency (EPA) has reviewed the draft version of the document entitled "Remedial Investigation Work Plan, Additional Groundwater Investigations, Stratford Army Engine Plant, Stratford, Connecticut". The document is dated October 12, 2001

EPA's comments on the above-mentioned document are provided in Attachment I to this letter

Should you have any questions regarding these comments, please contact me at (617)918-1387

Sincerely,

A handwritten signature in cursive script that reads "Meghan F. Cassidy".

Meghan F Cassidy  
Remedial Project Manager

Enclosures

cc Ken Feathers/CT DEP  
Michelle Brock/COE  
Peter Golonka/Gannett-Fleming  
RAB Members

## ATTACHMENT I

The following are EPA's comments on the draft version of the document entitled "Remedial Investigation Work Plan, Additional Groundwater Investigation, Stratford Army Engine Plant, Stratford, Connecticut" The document is dated October 12, 2001

### GENERAL COMMENTS

1. In the Introduction, the text indicates that "This Work Plan is intended to address comments by the United States Environmental Protection Agency on the Draft Remedial Investigations Report" EPA notes, and the text should be clear on this fact, that EPA comments on the Draft RI were quite extensive. While the work proposed in this Work Plan will address many issues raised in relation to the groundwater beneath the site, this Work Plan does not address all of EPA's concerns. The text should be clarified to ensure that it is clear that EPA's December 2000 comments discussed more than just the need to further delineate VOC groundwater contamination

1. The Work Plan represents an important and welcome effort to constrain better the extent of VOC contamination in groundwater, particularly beneath Building 2. A significant data gap in characterization of deep groundwater has been identified in previous reviews of various site reports. A particular concern for potential DNAPL has been noted, based on the very high concentrations of dissolved TCE observed in the overburden groundwater (approaching the solubility limit) and detections at or near the bedrock interface (e.g., 1,1,1-TCA greater than 100,000 micrograms per liter at CP-99-08). In general, the proposed drilling and sampling is well conceived to develop a better conceptual model for the extent and transport of chlorinated solvents. Deep wells HESE-01-05D, -06D, and -07D are particularly important, in that they target the apparent bedrock valley running to the northwest (identified in a seismic refraction survey), with -5D located in a local buried topographic minimum. Spatial coverage of the targeted VOC contamination in the map plane is generally good, and target screen depths appear to be appropriate. The latter are either just above expected bedrock (appropriate for the DNAPL investigation) or in the known highly contaminated zone (typically ~20-30 ft bgs). A general reservation concerning targeting particular, pre-determined depths for well installation is noted in the following General Comment

2. It is strongly recommended that all VOC drilling be coupled with interval sampling of groundwater to examine the vertical distribution of VOCs at the location of each new monitoring well. Experience at SAEP, as well as at many other locales, shows that VOCs can be found vertically in quite a complex distribution, particularly if the contaminant moved as a DNAPL. A case in point is cone-penetrometer location CP-99-08, where 1,1,1-TCA was found with two distinct maxima (concentrations >100,000 micrograms per liter), one in the interval approximately -20 to -40 ft msl, and the second above bedrock in the interval approximately -120 to -150 ft msl. One can easily miss important information about the distribution of the VOCs by targeting a single depth interval in advance. The screens placed just above bedrock are well motivated to characterize potential DNAPL that might be localized along this interface. However, with more detailed information, both the screened interval and the screen length might

be better chosen. For example, if one of the deep borings is found to go through a VOC zone at intermediate depth, but finds nothing at the bedrock interface, it may make more sense to screen the well in the contaminated interval rather than at the pre-determined target depth. Similarly, if there are indications that DNAPL is present in a very thin zone at the base of the overburden, a shorter screen may be appropriate for the final well installation. The hollow-stem auger (HSA) proposed for the shallower drilling is well suited to close-interval screening sampling (i.e., using a screened HSA). For the deeper drilling, other methods may be necessary. Extensive experience with deep, close-interval sampling has been developed at the Massachusetts Military Reservation. On-site GC analysis of the screening samples can guide the drilling and well construction.

3. It is not clear that the proposed program to delineate VOCs can be separated entirely from the chromium problem also found beneath Building 2. Proposed wells HESE-01-14I, HESE-01-15I, HESE-01-08D, and HESE-01-10D are all located within the area previously shown to be highly contaminated by Cr(VI) (e.g., 950,000 micrograms per liter at WP-99-15). Previous work in this area has shown both Cr(VI) and TCE at very high concentrations within the same general depth horizon (~-25 ft msl). This alone indicates that the chemistry of the groundwater, the detailed distribution of these contaminants, and their interactions are not adequately understood. These contaminants might be expected to interact strongly, for example, chromate may be expected to oxidize TCE, in turn reducing the Cr(VI) to Cr(III). The resulting Cr(III) may then become sorbed by, or co-precipitate with, ferric iron oxyhydroxide or other solid phases. Given the expense and obstacles of drilling inside the building, further exploration of the chromium problem should be folded into the VOC investigation proposed. This is particularly critical for the wells named above, which are in an area previously mapped as being impacted by chromium plating solutions. The interval sampling discussed in the previous comment should be performed in the shallow and intermediate-depth wells proposed for this area, and the analyte list for these wells should be expanded to include, at a minimum, chromium (both Cr(VI) and total) and iron. Manganese (already on the analyte list for MNA wells) should also be on the analyte list for all wells within the Cr-impacted area, as it can play a significant role in the reaction chemistry and transport of chromium. It would also be of value to the assessment of the chromium problem, as well as its interaction with the TCE, to obtain soil samples from the borings. The soils should be analyzed, at a minimum, for total chromium (total, water-soluble, and water-soluble Cr(VI)) and organic carbon. In addition, analyses yielding information relevant to chromium mobility in groundwater – e.g., total water-soluble chromium and water-soluble Cr(VI) – should be considered, as well as analyses for iron, manganese, and other metals. Chromium could be present as Cr(III), in various solid phases, e.g., such as CrOOH or  $(Cr, Fe)(OH)_3$ , following reduction by oxidizing TCE in the system. Alternatively, the chromium may be present as Cr(VI) in phases such as jarosite, where  $CrO_4^{-2}$  substitutes in the mineral structure for  $SO_4^{-2}$ . Solid phases should be investigated, as they may represent a significant residual and persistent source of chromium (including Cr(VI)) to the groundwater.

Any information that is already available regarding the above information should be briefly discussed in this Work Plan.

4. The analytical parameters proposed to support the MNA assessment are important and well motivated. Reduced iron, Fe(II), should be analyzed in the field (e.g., with a Hach kit) for these wells to provide further key information regarding the redox and microbial environment. In addition, because of the extreme VOC and Cr(VI) concentrations observed in groundwater for this site, additional characterization for MNA potential may be justified. In particular, it seems entirely possible that the concentrations of TCE and/or Cr(VI) are so high as to render significant domains sterile. Perhaps some sort of microbial assay could ascertain whether or not the site will support a population of degradative bacteria, and if there are thresholds for TCE and/or Cr(VI) above which such organisms cannot survive. This may be critical to an assessment of the potential for MNA as an effective remedy. If attenuation of the core of the TCE plume is to rely primarily on physical mechanisms (e.g., dispersion), the remedial time frame may prove to be exceedingly long, particularly given the low groundwater velocity shown to prevail at the site.

5. The deep borings intended to explore for possible DNAPL at the overburden — bedrock interface seem to be based on an assumption that DNAPL would pool at this surface. While there is certainly some suggestion that this may be the case (e.g., 1,1,1-TCA at CP-99-08), it is also possible that the bedrock beneath the site is fractured, and that DNAPL has entered the bedrock. Consideration should be given to coring into the top of bedrock to characterize the nature of fractures that may be present, and to seek evidence for penetration of DNAPL.

### Specific Comments

**p. 4, sec. 3.2.2:** The rationale for siting the proposed piezometers is provided in the text, and includes previous detections, relationship to groundwater flow directions, and relationship to known sources. The locations chosen are well motivated in these regards. NAE piezometers D-4 and D-13 have previously detected rather high levels of TCE degradation products, and these areas are appropriately targeted for further characterization. Piezometer D-8 also shows fairly high levels of chlorinated VOCs, although not, apparently, directly related to the TCE (detections at this piezometer included 1,1,1-TCA and 1,1-DCA). This area is not targeted for further characterization. It is noted that the total VOCs (based on the results shown in Figure 3) at D-8 is about the same as that at D-13, which is proposed for further work. Additional delineation by piezometers should be considered for the vicinity of D-8.