



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



November 21, 2001

John Burleson
BRAC Environmental Coordinator
Stratford Army Engine Plant
550 S Main St.
Stratford, CT

RE: Preliminary Remediation Goal Development, Stratford Army Engine Plant, Stratford

Dear Mr. ^{John} Burleson:

I have reviewed the draft Remedial Investigation, Stratford Army Engine Plant, Stratford, Connecticut, prepared by URS Greiner Woodward Clyde Federal Services, dated September 2000 and received by DEP on October 26, 2000. I am herein providing comments relative to the scope and content of the report.

In general, the Remedial Investigation (RI) fails to fully integrate and synthesize the various lines of data and conclusions into a comprehensive evaluation of the environmental condition of the site. The report instead presents investigative activities and analytical results separately for each environmental medium, and for each phase of the investigation, thus fragmenting the data and analysis. In addition, data discussion is limited by the report's focus on exceedances of criteria. In an acceptable RI, the location and nature of Areas of Concern (AOCs), soil data, soil gas data, and groundwater data should all be examined to build a full and coherent description of the nature of any releases to the environment, through the use of release-focused conceptual site models (CSMs). In addition, because groundwater conditions are critical in evaluation of the environmental condition of this site, a complete RI should correlate groundwater findings with other data, in relation to both the release-focused conceptual models and a site-wide hydrogeologic conceptual model.

I believe that the data set may actually allow these issues to be addressed in a revised RI, although the general organization of the existing text may limit the clarity achievable through editing. I suggest that to improve the final RI the text be supplemented with additional sections focusing on interpretation and synthesis of the data to address the more detailed comments below. These comments are grouped conceptually, however concepts introduced in one section are equally applicable to others, and any response should be holistic in nature, rather than addressing the comments individually.

Areas of Concern

For each previously identified Area of Concern, the relevant data from all media must be evaluated to determine if a release has occurred and, if so, identify its extent and degree. A tabular summary of this evaluation should be included. For the site to be considered remediated it is essential that

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the environmental status of all potential AOCs be resolved, first by documenting the investigation determining whether or not a release has occurred.

As part of the above discussion it is appropriate to compare pollutant levels, in any identified release, to remedial criteria, however the entire extent of the release must also be discussed. Note that Connecticut's General Statutes (CGS 22a-423) define pollution without reference to a limiting risk-based threshold level. Thus, the description of a release is different from determination, under Connecticut's Remediation Standard Regulations (RSRs), that a release requires no further action. The RI's limitation of discussion to only data exceeding applicable criteria inappropriately merges these activities.

All environmental data in the final RI should be critically examined in relation to the conceptual site model applicable for each identified area of concern. The objective of this evaluation is to ensure that the field observations, sampling locations, and analytical results, from all media sampled, are consistent with the nature of the release as described by the conceptual model. Data are not provided in the RI regarding field observations and the detailed placement of sample locations relative to the targeted area of concern, therefore the adequacy of the field implementation of the RI work plan cannot be evaluated. Also, as previously noted, cross-media correlation of findings has not been conducted, therefore there are no reviewable RI conclusions regarding CSM adequacy and data consistency.

Such critical examination should also determine if additional data are necessary to resolve discrepancies or develop a further understanding of any area of concern. DEP expects that some AOCs will require further characterization, either prior to or during remediation, because the general level of effort in the RI work plan, while capable of determination of the presence or absence of a release, was not necessarily sufficient for full characterization of the degree and extent of any individual identified release. (See further discussion under "soil" below.)

Soil

All locations with releases, whether in exceedance of remediation criteria or not, must be more clearly identified, and related back to the source area and release mechanism through the CSM. Although areas exceeding criteria are generally noted, the text downplays them in its overall presentation, and does not include discussions of contaminant origin and extent. Such information is necessary to evaluate remedial options.

The report does not contain discussion of how soil samples at each area of concern were optimally located through field consideration of the potential release mechanisms and the CSM.

Residential direct exposure criteria must be used for screening interpretation of soil data, although soils exceeding residential criteria but less than industrial criteria may also be separately identified.

Some soil analyses for some semivolatile organic constituents have analytical detection limits above the established RSR criteria, yet this aspect of the data is not incorporated in the discussion. A conclusion that there is not a substantial release may be based on such data, however a conclusion that the remediation criteria are met cannot be made. Data quality relative to the decision criteria should be discussed in the text, for all constituents, and tabulations should incorporate appropriate notations where detection limits affect validity of conclusions. Further

evaluation, with more sensitive analytical approaches, may be necessary; alternatively, in section 22a 133k 2(e)(3) the RSRs provide a mechanism to address matrix interference effects.

DEP understands that both the native geologic material and the fill material may contain analytes of concern, such as arsenic. The nature of these materials should be specifically discussed, as it may expectably affect interpretation of data for identification of releases. An acceptable working conceptual model for the site is that an overlapping patchwork of small releases is superimposed on a polluted fill soil. If this proves to be the case, some releases might not be discretely identifiable, and others might require no additional characterization, because they differ little from the polluted fill. The RSRs (section 22a 133k-2(c)(4)(C)) provide an exception for pollutant mobility remediation when polluted fill meets specified criteria, and the RI should include a section addressing the data needed to support this regulatory option. Note that specific identified releases might still require implementation of local remediation to address mobility of pollutants superimposed upon the fill.

Evaluation of pollutant mobility is critical in developing remedial options for the site soils. The report does not discuss the selection process for leach testing of soil samples. If all samples with potential to leach above the pollutant mobility criteria were not specifically selected for leach testing, the finding for several inorganic constituents that "no samples selected for SPLP analysis exceeded the PMC" is misleading. Reported soil results indicate mobility concerns for TPH exist. cursory review of data tables indicate that volatile organic compounds may also exceed mass-based pollutant mobility criteria in some cases [SB06A3-1C, for example], yet this is not noted in the text.

There should be appropriate further evaluation recommended. Based on preliminary review of the data for all media, I recommend that, at a minimum, the material and waste handling areas near buildings B38/64, B34, and B19 be targeted for further evaluation. The sump in building B-13 should also be evaluated.

Groundwater

The groundwater conceptual flow model should be critically reexamined, and discrepancies should be resolved to develop a cohesive description of the three-dimensional flow as it relates to stratigraphy and is reflected by pollutant migration from identified sources. All data sources and types of data should be incorporated in this consolidated synthesis, which is likely to identify some data gaps. Points to address in the re-evaluation include:

The areal relationship of the peat and silt, which is not discussed, and the hydrogeologic effects. The RCRA groundwater monitoring program at the site interprets the peat as a local control causing perched groundwater flow.

The origin of groundwater mounding under building 2, which is an area of downward gradient and limited recharge.

The calculated discharge to the river, which is inconsistent with the low recharge expected for a paved site with a stormwater collection and treatment system.

The use of significant digits, which introduces a false sense of precision to most of the hydrogeologic calculations.

Improved estimation of permeability through comparison of slug test, grain size evaluation, cone penetrometer data, and pump test data.

The text's emphasis on the importance of high permeability zones on contamination migration, yet its subsequent use of an average permeability for calculations.

Focused delineation of flow system and contaminant transport details at the shoreline and in the tidal flats discharge zone.

Characterization of the base of the flow system, interaction with the bedrock, and the details of bedrock hydrogeology, including effects of fracturing and regional structures.

Distinctions between the shallow local flow and the deeper regional flow patterns, and how regional bedrock relief affects the flow systems.

Factors limiting downward migration of chrome and solvent plumes, including stratigraphy and salinity.

Anisotropic permeability, which is not supported by any differing vertical and horizontal permeability data, as a control on vertical movement of pollutants. Vertical migration control may be more simply explained by differing horizontal stratigraphy, which would appear at a macro scale as anisotropy.

Inconsistencies between calculations of diffusion transport and observed pollutant distribution, as noted in the RI.

The division of site hydrostratigraphy is not carried consistently throughout the RI. Three depths are discussed yet the shallow and intermediate are grouped for developing the groundwater maps. The concept of three aquifer layers should be validated through an examination of all lines of evidence, including stratigraphy, hydraulic properties, potentiometry, tidal effects, water quality, and pollutant distribution. The validation should include a focus on existing intermediate depth wells and identify how each relates to the conceptual flow model. The results of this validation may indicate additional intermediate depth wells are needed to fully characterize flow in three dimensions.

I understand that a groundwater model is under development. Use of this model, and data requirements for its calibration, may disclose data gaps. Preliminary information presented to DEP about the groundwater model raises concern regarding the sufficiency of control data for both regional and local model development and calibration. Sensitivity analysis for variables affecting chemical fate and transport may also disclose site parameters requiring additional data collection.

Comparison criteria used in discussion of groundwater analytical results should be expanded:

The RSR groundwater volatilization criteria apply to all groundwaters, regardless of depth, when the water table is within 15 feet of a building.

Evaluation of metals in groundwater must take into account the presence of the tidal flat, where there is no dilution at low tide. The appropriate surface water protection criteria to apply are the chronic salt-water aquatic toxicity criteria in Connecticut's Water Quality

Standards. This may necessitate additional groundwater data be obtained with analysis by more sensitive methods.

Groundwater evaluation of chromium should be conducted using hexavalent rather than trivalent chrome for comparison to surface water criteria. Total chrome analyses should be considered as if they are hexavalent to be conservative.

The RSRs provide a mechanism for development of additional criteria when pollutants without established criteria are present in a release. The RI should identify what additional criteria must be developed.

Further evaluation of the nature of the metals, especially arsenic, detected in the berm area and elsewhere is necessary. The detection of metal pollution present above criteria cannot be dismissed as not related to the site without detailed evaluation of alternative origins and transport mechanisms. Are these metals related to the aquifer material? Are they dissolved? Are they colloidal? To what extent is water quality influenced by tidal effects and local sea water intrusion at the shoreline?

The presence of a sheen on groundwater samples is an important consideration in development and validation of the conceptual site model, such information should not be noted as an aside in discussion of monitoring analytical data.

All identified groundwater pollution should be discussed within the framework of both the site-wide groundwater CSM and release-specific CSMs. The RI tends to focus on only the most significant groundwater plumes. As an example, the groundwater data for the vicinity of Building 19 indicate localized pollution by organic chemicals, yet the source and mechanism for this pollution is not discussed. Other areas that should be discussed in detail are the cyanide presence behind B 2 and the presence of metals and cyanides near the closed RCRA lagoons. Note that additional areas of concern requiring source-focused investigation may be disclosed through evaluation of groundwater or soil gas data in this manner.

Discussion of groundwater quality should primarily describe the entire site groundwater condition, regardless of pollutant levels, and include non-hazardous chemical data clarifying groundwater flow dynamics; the RI focus on exceedances of criteria should be secondary. I recommend that the discussion also focus on spatial delineation of discrete or overlapping plumes of organic chemical suites, related to potential source areas, rather than separately delineating each organic chemical.

The RI "summary of contaminant transport" sub-section addresses the above concern to some extent, and should be expanded to more fully discuss site-wide groundwater conditions affecting remedial decision-making. Much of the contaminant transport discussion is qualified, with parameters based on literature value or site averages from limited information. To support remedial decisions the RI should identify data gaps that must be addressed to fully characterize controls on chemical transport and groundwater quality.

Surface Water / Sediment

The relation between water quality in the tidal ditch (008) and both groundwater quality in the vicinity of the RCRA closure area and the NPDES discharge should be examined, as it varies through a tidal cycle, to fully understand the possible pollutant origins. In addition, the discussion

of airport versus SAEP as potential source for detected pollutants in water and sediment should be expanded and clarified.

Spatial distribution of pollutants in the tidal flats must be further described. Include specifically the subsurface sediment data in a discussion of vertical variation in sediment quality. Discuss the spatial pollutant distribution in relation to potential sources, including the historic outfalls along the shore.

Note that additional data may be necessary to characterize the full extent of the identified nearshore area with potential ecological impacts. The Ecological Risk Assessment should be used to determine threshold levels of remedial concern, and a program to delineate sediment volumes in excess of these levels should be proposed.

The locations with detected elevated levels of PCBs, such as the 1994 sample with 130 mg/kg Aroclor 1248, require further testing to confirm their presence and evaluate the extent of contamination. Spot remediation of these locations to address identified ecological and human health risks may be necessary, and their characterization is insufficient.

Soil Gas / Indoor Air

Soil gas and indoor air data should be evaluated for consistency with the groundwater data, using the CSM framework for the site. I understand that a soil vapor model is under development for the site, which may facilitate this evaluation. Model calibration may identify data gaps in groundwater or soil gas characterization, or in transport-affecting site properties.

Risk Evaluations

DEP comments regarding the Ecological Risk Assessment will be forwarded under separate cover. Review of the Human Health Risk Assessment, as it relates to recreational and fishermen receptors, is still in progress, and will be forwarded when completed early next year. Please note that since the baseline risk assessment identifies unacceptable risks, the project should move forward towards further delineation of the environmental releases driving the risks, and evaluation of remedial options.

Detailed review of the main plant Human Health Risk Assessment will not be conducted at this time, because the end-point reuse is ill-defined, limiting the certainty of site specific exposure and risk evaluations. Note that the RSRs are risk-derived remedial criteria that DEP considers conservative in protection of human health for a wide range of conditions, and should be used in delineating areas requiring further characterization for remedial design, especially to address direct exposure risk from soils. The identified exposure risk for dermal contact with groundwater should be incorporated in the RI discussion of groundwater quality relative to evaluation criteria.

The draft RI identifies that indoor air quality at the SAEP potentially presents an unacceptable risk to occupants. The RSRs provide a flexible approach for evaluation of remedial requirements for this exposure. Note, however, that the implementation of a permanent remedy is preferred over implementation of an engineered or institutional control, and this can expectably require mitigation of the source of the volatile organic pollutants causing the risk. DEP understands that source mitigation will be included in the Feasibility Study as an option.

We have already discussed many of these comments at various BRAC Closure Team meetings in the past few months. Please contact me at 860 424-3770 if you have any further questions regarding these written comments.

Sincerely,



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RAB