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RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT ADDITIONAL COMMENTS ON ECOLOGICAL RISK ASSESSMENT OF THE DATA GAPS ASSESSMENT REPORT SITES 12 AND 13 TANK FARMS 4 AND 4 NS NEWPORT RI

1/3/2012

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

RIDEM's Additional Comments on the Ecological Risk Assessment of the Data Gaps Assessment (DGA) Report Sites 12 & 13, Tank Farms 4 &5, NETC

Comment 10: Page 7-22, Section 7.4.1 Soil Invertebrates, Whole Section.

The ERA states that maximum concentrations of several chemicals of potential concern (COPCs) exceeded Dutch Target Values (TVs) for soil, but because concentrations were well below Dutch Intervention Values (IVs), these COPCs were not retained for further evaluation under a baseline ecological risk assessment (BERA).

A preliminary benchmark screening is conducted in Step 2 of the EPA ERA process, and can be used as a preliminary screening tool to determine a) which constituents can be ruled out as COPCs, or b) which constituents may warrant further evaluation. For constituents brought forward from this screening step, additional refinement of the screening is then conducted under Step 3a, as per EPA guidance. This refinement may include evaluation of other benchmarks, spatial extent or number of exceedances, evaluation of magnitude of exceedances, or use of less conservative assumptions, if warranted. Thus, the exceedance of a preliminary screening level does not necessarily indicate that a BERA is required, only that additional refinement and evaluation of the contaminant is required.

The ERA used comparison of maximum concentrations to Dutch TVs for the preliminary screening and IVs as additional benchmarks under Step 3a. TVs are conservative benchmarks below which adverse effects are not anticipated. Dutch IVs, however, are representative of concentrations of contaminants that are associated with adverse effects and would likely require further remedial action. For this reason, IVs are not an appropriate benchmark to use in a screening-level evaluation. Given the several orders of magnitude difference in concentration between TV and IVs, there is considerable uncertainty on whether a constituent could pose a risk if it is present at a concentration above the TV but below the IV.

RIDEM suggests that the Navy consider focusing the COPC refinement by using 95th percentile UCL or average concentrations for comparison to TVs (or other appropriate benchmarks), in conjunction with evaluation of low frequency of detection (FOD; e.g., <5% of 20 or more samples), and evaluation of Site concentration relative to background. We acknowledge that for some constituents, this approach was used, but it is not transparent in the ERA that this approach was consistently applied.

We view this lack of consistency in approach to be the major issue underlying the COPC refinement process (for all receptors, not just invertebrates), and recommend that early on in Section 7.4, the Navy identifies a multi-step process that takes into consideration multiple lines of evidence such as those we recommend above, and uniformly apply it across all constituents.

Comment 11: Page 7-28, Section 7.4.2 Terrestrial Plants, Whole Section

In the ERA, surface soils are the endpoint identified for terrestrial plants. (Surface soils are defined in the DGA Report as the 0-1 foot depth interval.) RIDEM has stated that subsurface soils should also be evaluated. The Navy has stated that subsurface soils are not the relevant interval in the ERA.

RIDEM generally agrees that the bioactive zone is found near the surface, with much of the biomass found in the upper foot. However, the depth of this zone will vary according to a variety of factors, such as depth to groundwater, presence of bedrock, species of plant etc. Many plants common in the northeastern US may have long taproots that extend down throughout the unsaturated zone to the water table. A preliminary review of soil boring logs for the site suggests that most organics/roots are located within the upper two feet of the surface.

Furthermore, although this particular comment is specific to plants, a number of wildlife species may burrow well below the 0-1 foot interval, and thus may be exposed to COPCs present at depth, as well as transfer subsurface soils to the surface. Shallow soils may also be subject to erosion and frost heave, which could allow future exposure to subsurface soils through removal of the upper soil layer and/or mixing of strata. Therefore, because there is the potential for plants to be exposed to COPCs in subsurface soils, use of benchmarks based on endpoints such as germination or seedling growth are relevant for both surface and subsurface exposures.

Therefore, unless COPC concentrations are highest in the 0-1 foot depth interval, we recommend including subsurface soils within the exposure point. With regard to the soil depths typically used in ERAs, this varies across states and EPA regions, but often is defined as the upper 2-3' below ground surface (bgs). At portions of the site, shallow soil exposures are likely limited to some extent by a shallow groundwater table. We recommend extending the shallow soil interval to the lesser value between depth to groundwater and 3' bgs, unless it is documented that the higher contaminant concentrations are present at a shallower depth.

Comment 12: Page 7-28, Section 7.4.2 Terrestrial Plants, Whole Section

Screening levels for 16 SVOCs, Mitchell value. RIDEM has requested that a comparison of PAH soil results to soil screening values for plants (Mitchell 1988, as cited in EPA Soil Screening Levels for PAHs, Table 3.1) be provided.

The Mitchell 1988 values referred to in this comment include a range of soil anthracene concentrations associated with adverse effects on plant growth (EC50) and mortality (LC50) for a variety of plant species. Values range from 30 mg/kg to over 1,000 mg/kg. Navy also refers to a plant NOEC of 4,400 mg/kg from the Canadian SQG document for benzo (a) pyrene. The Navy rules out PAHs as COPCs for plants because all detected individual PAH concentrations are below 1,000 mg/kg.

Numerous PAHs have been detected in Site surface soils, and there are instances where individual results exceed the 30 mg/kg EC50. This value is for anthracene and may or may not be protective of exposures to other PAHs, particularly where mixtures of PAHs are encountered. Note that Table 3.1 of the Eco SSL document does provide a soil LOEC of 100 mg/kg for a PAH mixture, which may be a more appropriate benchmark to use. Table 7-1 of the DGA Report indicates a maximum and 95% UCL of total PAH exceeding this benchmark, but that the average detected concentration is below this value. Note though that EPA has determined that the available plant data are not sufficient to derive a SSL for plants.

There is generally limited information available on PAH toxicity to plants and the available values span two to three orders of magnitude. Given the lack of data available on PAH phytotoxicity, and

the relatively high uncertainty on selection of an appropriate benchmark, we recommend that risk to plants from PAHs be addressed qualitatively.

Comment 13: Page 7-28, Section 7.4.2 Terrestrial Plants, Whole Section

Several issues were raised in this comment related to the screening evaluation for terrestrial plants. These primarily were related to the elimination of COPCs that exceed benchmarks due to other factors (pH/bioavailability, conservativeness of benchmark, presence of vegetation etc.). RIDEM had also commented that contaminants that exceed screening levels are retained for a BERA. EPA ecological risk assessment guidance (EPA 1997) states that by Step 3a of the ERA process, constituents with HQs at or near unity, or based on overly conservative assumptions, may be reevaluated to determine whether the constituent should be retained under a BERA. Given this, however, RIDEM believes it is important to present a transparent and consistent process for further evaluation (see Comment 10 above), and that this process is not evident in Section 7 of the DGA Report.

Bioavailability Considerations. pH is one of the most influential characteristics on metal solubility in soil; in general, a decrease in pH is related to an increase in dissolution of metal complexes and a resultant increase in solubility. Thus, a decrease in soil pH leads to decrease in carbonate and other mineral complexes, resulting in the release of metals into free ion form, which is considered to be the more bioavailable form of metal. However, there are other soil characteristics beyond pH that affect bioavailability, such as the type of metal complex present, the soil organic and mineral content, and presence or absence of competitive metals. Certain plant species may also influence bioavailability of metals within their rhizosphere.

Further to this, effects-based benchmarks are just that—a concentration associated with an effect. The resulting concentration incorporates bioavailability, which will be unique to each field or laboratory test upon which the benchmark is based. Without site-specific data relative to bioavailability, it would be difficult based solely on known soil pH to determine whether a metal is more or less bioavailable, particularly at the screening step. Are the screening values used in the screening step based on a lower or higher pH than that of the Site? By the same token, if one uses a low Site pH as a rationale for excluding certain metals as COPCs, one would also need to take this approach for other metals whose bioavailability is known to increase with lower pH; i.e., are the screening benchmarks for some metals conservative enough at Site ambient soil pH? It is RIDEM's opinion that bioavailability studies are beyond the scope of a screening level risk assessment and, if warranted, should be conducted under a BERA.

Use of Vegetation as a Screening Tool. Regarding using presence of vegetation as a means to rule out COPCs, RIDEM disagrees with this approach. Although a habitat may be lush with vegetation, contamination may allow certain opportunistic species to take over, where other species do not thrive. A common example of this is the common reed, *P. phragmites*, which can easily take over roadsides where other vegetation has been reduced or eliminated due to winter roadway salting. Similarly, one would expect that metal or organic contaminants could potentially affect species composition. There is no mention in the ERA of species present, or how the vegetation community at the site is similar/dissimilar to those of reference areas—the latter would be a particularly useful evaluation to determine whether adverse effects are occurring on the site's plant community. However, such an evaluation would be beyond a screening-level approach and should be conducted under a BERA. Therefore, it is our opinion that it is inappropriate to use the visible presence of vegetation as a means to exclude a COPC from further assessment.

Sum of HQs. Benchmarks are based on a variety of endpoints, organisms and differences in study design and so it is not always appropriate to sum HQs to generate a cumulative hazard index (HI). However, where there is a common endpoint among COPCs, summing the individual HQs may be conducted.

Comment 14: Page 7-33, Section 7.4.3 Sediment Invertebrates, Whole Section.

General comment: RIDEM refers to these benchmarks as cleanup objectives/PRGs in this comment. We note, however, that the benchmarks used in a screening level ERA are not used nor are intended to be used as remediation goals for a site but are instead used only as screening tools to determine whether a BERA is required, as per EPA guidance (1997). Table 7-4 of the DGA Report indicates that a number of constituents in sediment have maximum concentrations exceeding TECs, particularly for PAHs and metals, with individual HQs ranging up to 12.4 (arsenic). Navy states that although TECs are exceeded, most constituents do not exceed the PECs, and this condition is used as the basis for the constituent's exclusion as a COPC. While TECs are concentrations that are unlikely to result in adverse effects to benthic invertebrates, the PECs are concentrations that are expected to result in adverse effects to invertebrates the majority of the time, and as such, should not be used as a sole screening tool to rule out risk to this class of organisms.

However, an exceedance of a TEC does not necessarily indicate risk. When a concentration of a contaminant is between the TEC and PEC, other measures such as the mean PEC quotient may be employed (Long et al., 1998) to determine whether the magnitude of exceedance is ecologically relevant and would warrant further evaluation. Regarding TECs/PECs for PAHs, RIDEM has reviewed the original paper in which the sediment ΣPAH model is identified (Swartz 1999), which states that "[g]guidelines for individual PAHs seem inappropriate" in light of the cumulative effects of PAH mixtures, and that a ΣPAH consensus guideline is a better predictor of ecological effects, noting that benchmarks for individual PAH constituents is more likely to potentially underestimate or overestimate the overall toxicity of PAH mixtures. Indication of both individual as well as ΣPAH concentrations, as is the case in the ERA, suggests the need for further assessment of PAHs as COPCs.

Comment 19: Page 8-7, Section 8.8 Ecological Risk Assessment, Whole Section

RIDEM states that a BERA is needed for the Site, whereas Navy states that a full BERA is not required. Based on additional reviews of the ERA, it is our opinion that additional evaluation is warranted to allow any conclusion to be made on a path forward. A number of screening levels are exceeded in different media and for different receptors, suggesting that additional evaluation is merited. We do not feel that Navy has adequately demonstrated in a clear and transparent manner that, under Step 3a of the ERA process, the constituents that do exceed ERA Step 2 screening levels do not present a potential risk to ecological receptors; however, it is not clearly evident in the ERA that a full-scale BERA is warranted at this time. In our previous comments stated above we have provided some recommendations for alternative approaches in selecting final COPCs for the site that may help clarify some of the issues we have discussed, and allow for future concordance between RIDEM and Navy.