Memo

Department of Ecology
Toxics Cleanup Program, CRO

March 26, 2012

To: Eric Koltes, L.G., Environmental Partners, Inc.
Aaron Galer, Northwest Pipeline GP

From: Norm Peck, Department of Ecology, TCP/CRO

Cc: Dale Myers, TCP/NWRO ; Patti Carter, TCP/ERO; Art Buchan, TCP/HQ, Steve Teel, TCP/SWRO

Re: Response to proposed Mathematical Regression Analysis of Bioassay Sampling Results; Higher-Range Petroleum Hydrocarbons in Soil for I-5 Corridor Compressor Stations – Northwest Washington Representative Area, dated March 13, 2012

Introduction: Northwest Pipeline GP (NWPL GP) and Environmental Partners, Inc. (EPI) proposed an approach to using fewer serial dilutions in a TEE plant bioassay that are called for in "Early Seedling Growth Protocol for Soil Toxicity Screening", the standard Ecology reference[1], and related references in A.8.6.11.1, Greene et. al., 1988, i.e. 5-6 dilutions of 0.3 to 0.5, with noted trade-offs in effort (cost) and precision of estimate. NWPL GP and EPI proposed, after conversation with Ecology, to regress a line from the original sample and three dilutions conducted to date to project an anticipated 'pass' level for lettuce germination and seedling biomass bioassays. It is anticipated that, although the technical memo proposing NWPL GP and EPI's approach is directly addressed to sites in the northwest bioregion as established for meter station TEE zones, the general approach for compressor stations will both use the bioregion approach and extend the protocol used for sites in the northwest region for other regions.

Ecology guidance response: After correspondence among Ecology site managers responsible for NWPL GP sites in each region and Mr. Arthur Buchan, Ecology's TEE technical expert, the following responses were formulated.

NWPL GP and EPI propose to exclude results characterized in the technical memo as 'outliers'. There is no identified technical problem with data collection, recording errors, or laboratory results. Ecology does not allow exclusion of data unless specific data collection or handling errors can be pointed to, mere excursion from expectations or patterns in other data points will not suffice. Therefore these 'outliers' will need to be included in the regression analysis.

In seeking to extrapolate to a cleanup concentration, the following guidelines must be adhered to:

- 95% confidence interval (band) is assigned to the regression line
- The regression line is linear at the endpoint
- R-square goodness-of-fit (fit) is at least .9

Since it seems unlikely that the regression on the points available (including those NWPL GP and EPI have considered 'outliers') to meet these criteria, an additional bioassay run at the projected endpoint will be needed to confirm that the projected 'pass' level will indeed result in a bioassay result 'not

significantly different than the control' (at the .95 level, or a T-Test at the .05 alpha level for normal or lognormal distributed data).

Discussion: Ecology is willing to accept a 'passing' result, if one is obtained at the contaminant level predicted by the regression without requiring the full dilution series. This would result in a cost savings and possibly a time savings over continuing the full dilution series. There is, however, the acknowledged risk of either obtaining an overly conservative cleanup level (if the actual maximum pass value is greater than the projected value) or encountering a 'fail' at the projected level, resulting in the need to conduct an additional dilution to obtain a 'pass' (on both the germination and biomass lettuce bioassay). If NWPL GP and EPI's construction schedule would not accommodate the need to run another bioassay if a failure occurs at the projected level, or tolerate the potential for an overly conservative cleanup standard selection based on a 'pass', reversion to a continuation using serial dilutions is encouraged.

Conclusion: If NWPL GP and EPI obtains a passing result on bioassays at the projected level based on the regression, that outcome is acceptable to Ecology. With only three dilution levels tested, however, the present results alone are not sufficiently conclusive to rely solely on the regression results. Continuation of the dilution series by carrying out the .125, .0625, .03125 etc. dilutions until a pass is achieved is also acceptable to Ecology.