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DEPARTMENT OF ECOLOGY
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August 5, 2019

Shane DeGross
BNSF Railway Company
605 Puyallup Avenue
Tacoma, WA 98421

**RE: Ecology comments on draft Inundated Lands Initial Investigation Work Plan Addendum:**

- **Site Name:** BNSF Track Switching Facility aka Wishram Railyard
- **Site Address:** 500 Main St., Wishram, Klickitat County
- **Facility Site ID No.:** 1625461
- **Cleanup Site ID No.:** 230
- **Agreed Order:** DE 12897

Dear Shane DeGross:

Thank you for the submittal of the above-referenced draft work plan in accordance with Agreed Order DE 12897. Below are the Department of Ecology's (Ecology) comments on the draft work plan. Please review and incorporate edits for Ecology's review and final approval.

## General Comments

**Comment 1.** The Sediment Management Standards (SMS) site identification process is incomplete. The proposed Initial Investigation through TarGOST profiling and confirmational sediment sampling focuses primarily on petroleum hydrocarbon non-aqueous phase liquid (NAPL). Granted, the surface sediment samples will include analysis for PAHs as another constituent that may be present in association with the NAPL. However, the scope of work for this initial investigation is incomplete. Additional sediment sampling is required for suspected contaminants that may have released at the railyard and conveyed through point sources to deposit in sediments either pre-inundation or post-inundation.

Please incorporate additional surface sediment sampling locations at the seven outfall locations shown in the attached kmz file, either during the current investigation phase or in a subsequent investigation phase.

These areas of potential concern (AOPCs) include two municipal sewage outfalls, the current publicly owned treatment works (POTW) outfall, the stormwater underdrain, and former oil drain lines or other waste lines. The investigation should focus on the point of discharge, along the channel historically cut into the bank, and in any depositional area at the bottom of the historical bank.

**Comment 2.** Under the SMS, the potential contaminants of concern (PCOCs) and other parameters to be assessed with sediment sampling in the AOPCs include the following:

- Total petroleum hydrocarbons (diesel range and residual range organics)
- Total polycyclic aromatic hydrocarbons and semivolatiles (full Method 8270 analysis)
- Polychlorinated Biphenols (total PCB Aroclors)
- Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc)
- Pesticides/herbicides (4,4-DDD, 4,4-DDE, 4,4-DDT, Aldrin, Chlordane, Dieldrin, Heptachlor, Lindane, Hexachlorobenzene, Pentachlorophenol)
- Grain size and TOC

The recommended analytical methods for these analytes are listed in Table 5-1 of the Sediment Cleanup User's Manual II (SCUM II).

Regarding the number of samples, this has yet to be determined for the AOPCs. SMS recommends a minimum of at least 10 samples per AOPC to yield a statistically robust number. However, some surface sediment samples have already been collected in the NAPL area. In this case, four additional surface samples in the NAPL area is likely sufficient plus four surface samples around the edges of this area. Background samples for the analytes listed above, if not previously assessed, is also required.

**Comment 3.** In the work plan, describe what activities you will implement to comply with cultural resource requirements during the offshore investigation. State whether or not this work will proceed under the existing archaeological permit.

**Specific Comments**

**Comment 4.** **Section 2, Characterization Stage Conceptual Model:** The report states that occurrences of NAPL appear isolated from the upland impacts based on upland borings along the shoreline and on the sediment cores and the Dart samplers immediately south of the riprap area.

In other words, there do not appear to be any active NAPL seeps. However, I caution that the conceptual site model is subject to change based on new information including the evaluation of the dissolved-phase data. For instance, persistent and relatively high concentrations of dissolved-phase contamination may indicate residual NAPL proximate to the monitoring point.

Despite success in cases involving coal tar at MGP sites, the relative "non-success" of the Dart system in evaluating the presence of heavy oil may partially be attributed to a mismatch in technology. Here, we were using UVOST in a petroleum mixture that contains a lot of long chain PAHs such that internal quenching mechanisms may dominate and as a result, the response begins to weaken. If the mixture were predominantly diesel then the fluoresce response should increase with pore saturation. For a heavy oil mixture, we may actually see an inverse response with increasing concentration of NAPL and a corresponding decrease in LIF-UVOST response. If, however, the solid-phase extraction (SPE) media in the Dart sampler preferentially incorporates the short chain PAHs then it appears unlikely that internal quenching will be an issue. In any event, this phenomenon may be overcome by in-situ TarGOST investigation which is the technology being used in this supplemental investigation.

**Comment 5.** **Section 3.1, Project Team and Stakeholders**: The work plan states, "*Work will be performed in coordination with Ecology*." Later, in Section 4.3, Data Evaluation and Reporting, the work plan states, "*During Phase 1, TarGOST data will be reviewed by the project team to evaluate if and where further step-out locations may be required to bound the extent of the NAPL*." … "*BNSF, or Jacobs at the direction of BNSF, will communicate to Ecology the status of step out borings*." It is unclear based on this text and on Figure 4-1, how you intend to step-out. Presumably, the step-outs will proceed along the grid nodes in one or more compass directions. For example, if you find NAPL at the point just west of G200, will you step-out three points, one each to the north, west and south or five points, one each to the north, northwest, west, southwest and south? The latter pattern is more comprehensive in coverage and is Ecology's preference.

Alternatively, to address comprehensiveness, I suggest raising the mandatory number from 18 to 23 with points distributed based on the typical wind direction from west to east and the northward component of the wind towards the shoreline. My suggestion is to add the following:

- One at the west end of the E transect
- Two at the west end of the K transect
- One at the east end of the K transect
- One at the west end of the I transect

**Comment 6.** **Table 4-1, Sampling and Analysis Summary for Supplemental Sediment Investigation:** What is stated in the table regarding the number of samples for bioassays is not consistent with the text in Section 4.1.2 and possibly inconsistent with Figure 4-2. The table lists that only one bioassay sample will be collected as opposed to the text, which implies ten samples and the flow chart, which appears to state three. Please clarify this apparent inconsistency.

Footnote b of this table should not require that all contaminants of concern (COCs) exceed their respective standards, but rather that at least one COC exceeds its respective standard, since this criteria will result in site identification. Please correct or remove this footnote.

Footnote c of this table states that bioassay samples will be collected outside of the NAPL-impacted area, which does not make sense for purposes of site identification override. Please explain this footnote within the context of SMS and SCUM II.

**Comment 7.** **Section 4.1.1, Phase 1 – Characterization of NAPL Extent:** I recognize that TarGOST is a screening or profiling tool that can provide information to co-locate areas for confirmational soil/sediment sampling. In general, I have reservations regarding the efficacy of TarGOST as a screening tool to initially delineate the bounds of sediment contamination, especially in the outboard extent of the study area.

Limits of detection (LOD) for TarGOST can range from 100 to 500 ppm NAPL, according to the Dakota Technologies website. That LOD is good for detecting separate phase mass, not aqueous-phase mass. In contrast, the SMS diesel range organics (DRO) standards entail a SCO of 340 mg/Kg and a CSL of 510 mg/Kg. I question whether the tool can always achieve the specified LOD. The LOD may be a function of factors like substrate characteristics, which together with product properties, determine saturation such that the LOD will vary and likely not capture chemical concentrations for evaluation under SMS.

It is also known that high organic content may decrease the LOD. LOD is improved when the organic content decreases and the porosity (grain size) increases. I note that the total organic carbon (TOC) in the sediments range from 3,380 to 107,000 mg/Kg with higher TOC found farther from shore. I note also that the sediment samples assessed in TestAmerica's particle size distribution report show the grain size is dominated by the fine sand and the silt/clay fractions. In four of the seven samples, the silt/clay fraction is the highest weight percentage of the total sample.

Regarding dissolved-phase mass, UVOST-LIF may detect dissolved-phase concentrations for heavy petroleum hydrocarbons where 2- and 4-ring PAHs reach high concentrations in pore water directly adjacent to heavy NAPL (source: Dakota Technologies). However, it was this issue itself that prompted the development of TarGOST-LIF, which effectively deals with the dissolved-phase interference issue.

For the reasons cited above, TarGOST should not preside when seeking to investigate a potential sediment site. Provided it is properly implemented with collection of co-located sediment samples then it is potentially a good tool. Given this situation, the wording in the following section titled, Confirmatory Sediment Borings, should acknowledge that the sampling should not be limited to six sediment cores maximum.

**Comment 8.** **Same Section**: Figure 6-3 (Wishram NAPL Mobility Investigation Process) of the Nearshore Sediment Initial Investigation Work Plan shows a table that plots DART UVOST response to pore fluid saturation (PFS) and core segment TarGOST response to PFS. According to the flow chart, the correlations developed would allow translation of LIF responses to PFS. Please explain how you derived 50%RE TarGOST as the cutoff for NAPL to help determine where to place step-out locations. Also, are you referring to 50%RE as the average value of the fluorescence response or to that percentage as seen in the maximum fluorescence value?

I do see that Figure 3-5 (NAPL Mobility Core Results) of the draft Inundated Lands Initial Investigation Report compares NAPL saturation to TarGOST %RE for samples collected at G200 and G260. This figure shows the TarGOST response that coincides with the NAPL saturation of twelve samples collected at those locations. Six samples of these samples (G200-K, G200-L, G200-M, G260-E and G260-F) show greater than 50%RE as an average value and in the maximum value. An additional six samples (G200-J, G200-N, G200-O, G260-D, D260-G, and D260-H) show average values below 50%RE but have maximum values that exceed 50%RE. Again, what is the basis for establishing 50%RE as the cutoff value?

I did not see the raw data for the ex-situ TarGOST analysis in the draft Inundated Lands Initial Investigation Report. Please submit the TarGOST logs including the raw data files used to construct Figure 3-5.

On other sites such as Wychoff/Eagle Harbor, the cutoff value was determined by comparison to analytical concentrations yielded from soil core samples. For Wychoff, the NAPL cutoff value is 10%RE and 50%RE is the value for evaluating the boundary between mobile and immobile NAPL.

Of course, a different petroleum product (creosote rather than Bunker C) characterizes that site. In any event, the correlation should be based on empirical data since the %RE to delineate NAPL will vary with product type and weathering as well as soil properties (matrix effects).

We do have similar information for the uplands portion of the site in Table 4 of the draft Remedial Investigation Report that records both LIF results and TPH concentrations. I used that information in the Parker et. al. (1994) equation with assumed values for some of the parameters to calculate NAPL saturations based on Total Petroleum Hydrocarbon (TPH) values. Also, I used the same equation to back-calculate estimated TPH values for the sediment core samples and found values ranging from 80,851 mg/Kg to 217,133 mg/Kg. Based on that combined information, it appears that what you determine as the NAPL cutoff %RE value can vary considerably depending on substrate and product characteristics. This information suggests that 50%RE is set high for the petroleum mixture and that the cutoff value should be closer to 20-30%RE of the maximum response.

I recognize also that benchtop (ex-situ) UV analysis may be affected by oxygen quenching so that the fluorescence response is reduced. This effect can be overcome by using nitrogen gas to displace the oxygen so that the fluorescence response may appear to be more in line with what you may see in-situ. Indeed, you state, "*It should be noted that this threshold value was developed using ex situ measurements, which may vary from those seen in situ.*"

**Comment 8.** **Same section**: Regardless of the applicable %RE value as the cutoff value, Ecology asserts that the %RE should be based on the waveform interpretation similar to what was discussed in the TarGOST Investigation report produced by Dakota Technologies in 2013 for the uplands portion of the site. For instance, NT-10 exhibited a %RE responses having an average of 4.1%RE but the maximum response is 28.6%RE. The fluorescence responses in the uplands NT transect tend to be dominated by the blue channel which indicates laser scatter (backscatter) and the overall waveform callouts suggest "clean" soils" with the exception of some logs which indicate possibly low concentrations of fluorescing organics of unknown composition. The classification or quadrant plotting of the logs, TG-NT-10, TG-NT-11, and TG-NT11-E40 shows an uncharacteristic distribution of data compared to the data distributions of other logs that look more characteristic of what appears to be a diesel-like or a heavy oil-like composition. Indeed, this unusual data distribution is described as an artifact in Dakota Technologies' report.

In contrast, in that report three other representative waveforms are identified with patterns, which suggest the presence of NAPL.

Will the sediment TarGOST investigation include evaluation of the LIF responses similar to what we saw in the 2013 TarGOST Investigation Report so that artifacts (false positives) can be identified, including using non-negative least squares fitting?

**Comment 9.** **Same Section**: This section describes comparison to the results from the ex-situ TarGOST (LIFFCA) analysis. Dakota Technologies recommends calibration on a NAPL sample collected onsite prior to conducting the LIF survey. Was any calibration performed on a site-specific NAPL sample? If so, was the NAPL collected from the in-situ Bunker C collected in place at depth or was the NAPL collected as in-well LNAPL?

Based on LIF log, OHM-1-DART, it appears that a previous calibration may have been performed on in-well LNAPL. Is what we see as in-well LNAPL representative of the in-situ NAPL in the sediments whether we use UVOST or TarGOST?

Also, does the production of LNAPL in those OHM wells that are screened into the NAPL bodies result from redistribution from the constituent mix of heavy oil and possibly other petroleum products deeper in the substrate or is the NAPL sourced from the lighter, more diesel-like contamination that resides near the water table?

**Comment 10.** **Same Section**: The case narrative in the Treatability Report states that Section 4.3 of API RP40 (Dean Stark, Distillation Extraction Method) was modified. What elements or portions of the process are modified?

In addition, I note that according to API RP40, error is introduced into the calculation of oil saturation if the true oil density is not known and an assumed density value is used. The footnote to tables in Appendix D state: "*No location-specific NAPL density measured. Assumed density of 0.96 g/cm$^3$ per pervious upland study*." How significant is this error?

**Comment 10.** **Same Section:** The plan states: "*The six primary locations on the E grid line shown on Figure 4-1 will serve to confirm the absence of nearshore NAPL and isolation of the submerged NAPL that is present farther offshore within the inundated lands*."

I understand that the different types of data inform a line of evidence (LOE) approach. However, the currently proposed nearshore TarGOST transect cannot confirm the absence of nearshore NAPL and lack of connection between the submerged NAPL and the upland NAPL, given that we continue to see dissolved phase impacts.

However, it is possible that dissolved-phase impacts are consequent of wells that are screened across the smear zone that can produce groundwater samples that are biased high by entrained non-dissolved petroleum from residual NAPL (Zemo, 2006, Zemo and Foote, 2003). They suggest determination of the effective solubility may yield information to infer the presence of separate phase product proximate to the monitoring location.

**Comment 11. Section 4.1.2, Phase 2 – Surface and Subsurface Sediment Characterization**: Just as ten sediment chemistry samples are recommended to provide a statistically sufficient sample size for site identification, bioassays should be conducted on a statistically sufficient number of samples for use as an override, rather than just the three highest samples. A specific number of bioassays should be stated, along with how they will be selected for purposes of a site identification override.

**Comment 12. Same Section, Surface Sediment Samples**: Samples collected for comparison to the SMS site identification criteria should represent the biologically active zone of the water body being sampled, e.g., see the discussion in SCUM II, Section 3.4.1. Please provide a rationale for how you determined what constitutes the biologically active zone (BAZ) for surface sediment sampling. Are you applying a default or is the BAZ based on empirical data?

**Comment 13. Same Section, Sediment Leaching Samples**: Explain how EPA Method 1316 differs from the method used in the initial work plan to assess leaching.

Also, how is the simulated leaching method a better indicator of potential chemical partitioning that may affect benthos than an analysis of pore water? Pore water is considered to represent surface water yet the freely dissolved concentration ($C_{FREE}$) in the pore spaces may be the more appropriate surrogate for exposure to bioavailable chemicals compared to other media such as sediment and the water column.

Passive sampling is a common technique for collecting $C_{FREE}$ samples. Is passive sampling not applicable for measuring any of the COCs and/or the PCOCs as freely dissolved chemicals?

I spoke with a laboratory manager and he stated that Method 1314 might be a process that is more applicable over Method 1316 since the sample is typically treated on an "as received" basis and that method uses an upflow percolation column. The laboratory manager also stated there is a significant cost different between pore water analysis versus the leaching methods (1300 series). With Method 1316, the sample preparation runs about $3000 per sample while pore water analysis runs about $1000 per sample.

Since Method 1316 calls for a sample that is >85% solids, will the sample be air-dried then re-saturated or will it be treated on an "as received" basis with no air-drying? If the former, then the process may result in loss of chemical constituents.

**Comment 14. Attachment 2, Sampling Analysis Plan Table Updates, Freshwater Bioassay**: SCUM II recommends a bioassay sample holding time of 2 weeks, and differs from the longer Dredged Material Management Program (DMMP) hold time of 8 weeks listed in the table. Section 4.6.1.2, Bioassay testing, of SCUM II, states "*If there is no compelling reasons otherwise (such as the tiered testing schedule under DMMP), a maximum holding time of 2 weeks is recommended, and based on the analyst's best professional judgment*." Please explain why you selected the longer holding time and whether it is justifiable based on the knowledge of the in-water portion of the Site.

**Comment 15. Attachment 2, Table 3-1, Sediment Sample Containers, Preservation, and Holding Time Requirements**: For bioassays, the container size is listed as one 5-gallon bucket. Is this volume sufficient in reference to SCUM II, Table 4-6 (Minimum sediment sample sizes…) and for the number of samples expected as determined in the answer to Comment 5? Please ensure that sufficient volume for all of the bioassays is collected or provide a contingency in the event it cannot be achieved.

You can reach me at (509) 454-7836 if you have any questions regarding Ecology's comments.

Sincerely,

John Mefford

John Mefford, LHG
Cleanup Project Manager
Toxics Cleanup Program
Central Regional Office

Enclosure (1): Kmz file printout

cc: Allyson Bazan, Office of the Attorney General, Ecology Division
Brooke Kuhl, BNSF Railway Company
Matt Wells, Tupper Mack Wells PLLC

# Location of Outfalls

Seven outfalls are shown from west to east: 1) Wishram POTW outfall, 2) former sewage outfall, 3) waste line outfall from oil/water separator, 4) underdrain, 5) outfall from engine house or other bldg, 6) outfall from engine house or other bldg, and 7) former sewage outfall.