Memo

SUBJECT
Response to ASKO and BNSF Property Line Data Summary Memorandum

TO
Tena Seeds, PE
Washington Department of Ecology

DATE
December 12, 2024

SITE NAME
Time Oil Bulk Terminal BNSF Property
Agreed Order No. DE 18042

COPIES TO
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This summary was prepared by Arcadis U.S, Inc. on behalf of BNSF Railway Company (BNSF). Floyd Snider prepared the ASKO and BNSF Property Line Data Summary Memorandum (memorandum) to summarize their understanding of the conceptual site model for soil and groundwater along the property boundary between the BNSF Property and the ASKO Hydraulic (ASKO) Parcel on the Time Oil Bulk Terminal Site. The memorandum suggests that an interim action is needed on the BNSF Property to prevent ongoing migration of impacts from the BNSF Property onto the ASKO Parcel. This suggestion is not fully consistent with the data, the history of the site including recent remedial actions (RAs), and the overall conceptual site model as developed by BNSF. Key differences and related supporting data are discussed below.

Introduction		
1	"The key finding of this updated understanding of the CSM is that groundwater contaminated with trichloroethene (TCE) continues to migrate from the BNSF parcel to the ASKO parcel at concentrations exceeding the Site cleanup level. Immediate action by BNSF is necessary to address the flow of TCE-contaminated groundwater onto the ASKO parcel where a cleanup action has already been implemented."	The simplest explanation for the data and trends observed since 2021 is that the completion of in situ solidification (ISS) and related activities (including installation of H-piles during Perched Water Bearing Zone (WBZ) interceptor trench installation) mobilized CVOC mass that had previously been located in low-permeability zones in and around the ISS area. There has been no change in subsurface dynamics or conditions on the BNSF Property; no new sources of CVOCs identified on the BNSF Property, no intrusive work performed on the BNSF Property beyond soil borings and well installation; and no reason that an immediate action should be necessary other than to address unexpected consequences of the RA conducted by the adjacent property owner.
Background		
2	"The BNSF parcel, just south of the ASKO parcel, contained the shallowest impacts and the greatest TCE concentrations in perched groundwater (7,800 micrograms per liter [µg/L] at well 01MW92 in 2014; Floyd|Snider 2020). Based on these findings, the primary source of TCE on the ASKO parcel was	"Releases during railway operations" is a mischaracterization, as BNSF operations at the property did not involve use of CVOCs. Releases at the site, whether on the ASKO Parcel or BNSF Property, would have been associated with operations conducted at the loading dock area by

	concluded to be releases during railway operations on BNSF. Data collected during the RI activities found that TCE was present in soil and perched groundwater (the perched water bearing zone [WBZ]) on the BNSF parcel, and migrated downward and downgradient into soil and groundwater in the shallow WBZ on the ASKO parcel."	Time Oil site personnel. There are not sufficient data to conclude that elevated concentrations in the Shallow WBZ are related to migration from one parcel to another. Prior to the RA on the ASKO Parcel, the highest concentrations of TCE along the property boundary were on the ASKO Parcel at 01MW71 with a concentration of 120 mg/kg. The greatest concentration of TCE observed on the BNSF Property was near 01MW71 at SB-BN-06 with a concentration of 30.5 mg/kg (almost 75% less than concentrations observed on the ASKO Parcel). Impacts along the property line (and on either side of the property line) are more likely to have been mobilized through pile-driving and remedial construction conducted by the adjacent property owner.
3	"Cleanup activities[1] completed by TOCST under the PPCD (Ecology 2020b) on the ASKO parcel in 2021 consisted of in situ stabilization (ISS)—which immobilized TCE-impacted soil, eliminating the source of groundwater contamination—and installation of an interceptor trench with a permeable reactive barrier wall along a portion of the upgradient property line to address the most contaminated perched groundwater flowing onto the ASKO parcel from the BNSF parcel."	The groundwater analytical data does not support this statement and suggest the RA on the ASKO Parcel mobilized CVOC mass that was in low permeability areas. The ISS or other RAs would not be expected to eliminate the groundwater contamination instantly. For example, downgradient of the PlumeStop injections both TCE and VC increased sharply in concentration after the RA at 01MW85 (downgradient of a treatment barrier installed via direct-push injection). This TCE increase is not as pronounced at 01MW80, which refutes the idea of a single TCE-rich flow path from the BNSF Property to Commodore Way. These TCE concentration increases are to be expected through ISS and injection activities and are likely to attenuate – however, regardless of the abatement, the changes are not caused by BNSF and managing the results of the adjacent property owner's RA are not BNSF's responsibility.
4	"[1] TOCST approached BNSF prior to engineering design for the cleanup action, in an attempt to coordinate cleanup efforts in the area of the ASKO and BNSF property line, but was not successful."	The reasons for this coordination being unsuccessful are not due to BNSF. BNSF was interested in coordinating RAs, and attempted to communicate with the adjacent property owner regarding such coordination, but the adjacent

		property owner stopped responding to communications in 2020-2021 prior to beginning their RA.
5	"To date, BNSF has completed only a limited work scope consisting of soil collection and four rounds of quarterly groundwater monitoring on the BNSF parcel."	BNSF is in the RI stage of the Agreed Order schedule. BNSF is in the process of closing data gaps prior to proceeding to the Feasibility Study. One of the primary data gaps identified on the BNSF Property is the source of increased CVOC concentrations in the Shallow WBZ, given the only change in conditions are the adjacent properties RA, which has disturbed the Perched WBZ, Shallow WBZ and the aquitard that previously separated the two zones.
Summary of Property Line Area Data		
6	"The additional hydrogeologic data demonstrate that this remaining source contamination on the BNSF parcel is an ongoing source to groundwater and downgradient migration that has impacted groundwater quality on the ASKO parcel following completion of ISS."	There is no data to support that the elevated concentrations are originating solely from the BNSF Property, or from a changed condition of any type on the BNSF Property. The concentrations may equally likely be resulting from mobilization of mass near the property boundary on the ASKO parcel, and it is likely that the mass originated in and surrounding the ISS monolith or where the H-piles were installed. This would not necessarily involve intersection of a heavily impacted soil zone; in contrast, mobilization of a relatively small amount of TCE mass previously adsorbed or entrained in fine-grained soil could readily create the types of concentrations observed in recent groundwater data. For example, the observed increase in TCE in groundwater at 01MW93 (extrapolating to a one-meter by one-meter by three-meter saturated aquifer volume and estimated porosity of 35%) could be caused by liberation of only 1.1 grams of TCE from soil in a one-square-meter area.
7	"A maximum TCE concentration of 30.5 milligrams per kilogram (mg/kg) was detected at SB-BN-06, exceeding the soil cleanup level of 0.020 mg/kg, which is based on protection of groundwater quality. Results from this sample and adjacent SB-BN-05 (TCE result of 1.54 mg/kg) indicate that an area of TCE source contamination remains adjacent to and upgradient of the property line between ASKO and	While there are CVOC impacts in soil present on the BNSF Property, the concentrations are similar to or lower than results from prior samples collected in the same area. This shows that there is no new or previously unidentified source of CVOCs in soil that would explain the elevated concentrations in groundwater. The only change in condition was the installation of the ISS

	BNSF, which is a source of TCE contamination to groundwater in the shallow WBZ."	monolith and advancement of H-piles on the ASKO Parcel along the BNSF Property boundary.
Groundwater Quality		
8	"TCE concentrations decreased across the perched WBZ relative to their corresponding 2019 results, which is attributed to ongoing interception and treatment by the remedial elements constructed along the upgradient ASKO property line (refer to the summary of hydrogeologic study below for additional discussion of post-remediation groundwater flow in the perched WBZ)."	The interceptor trench on the ASKO Parcel is collecting water from the Perched WBZ on the BNSF Property, but not directly treating the Perched WBZ. The decreases in TCE are likely due to natural attenuation and the finite overall amount of CVOC mass on BNSF property.
9	"Temporary remobilization effects from ISS were not apparent downgradient of the ISS monolith."	This statement is not supported by the data provided by the adjacent property owner. See Comment #3 regarding the results of 01MW85. In addition, an increase in TCE concentration from 2019 to post-RA data in 2024 has been observed at 01MW56. Mobilization of impacts is expected to have been the greatest in the H-pile area upgradient of the monolith. H-piles were driven through the overlying material and through Perched and Shallow WBZs, including the separating aquitard, before the ISS monolith was installed. The idea that mobilized impacts would only appear downgradient of the ISS is not likely.
10	"Impacts from the TCE source material on the BNSF parcel migrate downgradient onto the ASKO parcel in the shallow WBZ west of the ISS monolith, demonstrated by elevated TCE in samples collected from the gravity well."	Elevated concentrations are present in the Shallow WBZ on the BNSF Property, but this appears likely due to the H-pile installation and the downward mobilization of CVOC impacts. The gravity well also provides a conduit for partially treated groundwater containing TCE at concentrations above the site-specific cleanup level to enter the Shallow WBZ; however, unless there is strong variability in concentrations exiting the treatment trench, this is not expected to be the main contributing factor to elevated concentrations in the Shallow WBZ (where concentrations are higher than the effluent from the trench).
11	"It is assumed that total DRO+ORO impacts in the shallow WBZ are caused by TPH- contaminated soils that are collocated with the residual area of TCE soil contamination near the property line area on the	Shallow WBZ soil samples were not collected during the remedial investigation, as soil was not historically impacted with petroleum hydrocarbons on the BNSF Property. The

	BNSF parcel. However, soil samples were not analyzed in the appropriate interval to confirm this finding."	petroleum hydrocarbon impacts in the Shallow WBZ could have been remobilized from low permeable zones associated with historical releases of oils/mixed hydrocarbons. Similar to CVOCs, petroleum hydrocarbons in groundwater prior to the RAs were below preliminary cleanup levels in the Shallow WBZ.
Hydrogeologic Study		
12	"Elevations in the perched WBZ are similar to pre-remediation elevations on the BNSF parcel; however, perched groundwater is no longer observed on the ASKO parcel. This is attributed to the interceptor trench at the property line, which drains the perched zone. Vertical gradients between the perched and shallow WBZ remain downward on the BNSF parcel, with slightly weaker downward gradients measured after completion of ISS and the interceptor trench. This shows a likely potential for ongoing downward migration of contaminants with groundwater from the perched to the shallow WBZ on the BNSF parcel, although the potential for downward migration is less than prior to remediation of the ASKO parcel."	BNSF has observed a decrease in water levels in the Perched WBZ, and this is most likely due to the interceptor trench and/or downward infiltration along new pathways created during H-pile installation. Additional monitoring is needed to confirm the degree to which this water level decrease is related to the above factors versus seasonal variability. Based on preliminary remedial investigation results, the permeability of the Perched WBZ is very low. The high CVOC concentrations on the ASKO Parcel (particularly the gravity well) are likely from the remobilization of CVOC mass from the low permeability zones into the Shallow Zone where permeability is higher.
13	"Shallow WBZ groundwater upgradient of the ISS monolith flows parallel to the property line to the west-northwest with a slight secondary flow direction to the southwest (i.e., between MW-BN-03 and 01MW93). This parallel flow along the property line is a slight shift from preconstruction flow and is attributed to the presence of the ISS monolith."	It does not appear that flow from 01MW60 and 01MW61 is to the northwest, but the groundwater is likely flowing around the ISS monolith due to its impermeable nature.
Updated Understanding of Property Line CSM		
14	"Dissolved TCE exceeding the cleanup level in the shallow WBZ migrates downgradient in the direction of groundwater flow, resulting in cleanup level exceedances at the gravity well on the ASKO parcel. Shifts in the secondary horizontal flow directions following ISS have also caused apparent changes in the TCE plume geometry upgradient of the ISS monolith, resulting in detections of TCE in cross-gradient wells to the southwest on the BNSF parcel. The continued downgradient migration of TCE onto the ASKO parcel poses a recontamination risk to a	See Comments #6 and #7. The data does not confirm that the impacts on the BNSF Property are the source of remaining impacts on the ASKO Parcel.

	portion of the Site where cleanup action has already been implemented."	
15	"The migration of TPH downgradient onto the ASKO parcel is of lesser concern for achieving cleanup levels because the magnitude of the cleanup level exceedance is much less than the TCE exceedance. However, the geochemical impacts resulting from dissolved petroleum may be of concern for the design basis and performance of the downgradient in situ treatment barrier."	See response to Comment #11. BNSF does not expect degradation of petroleum hydrocarbons to influence the adjacent property owner's RA.
Recommendations		
16	"The additional RI data collected on the BNSF parcel demonstrate that remaining source contamination is present on the BNSF parcel, which continues to migrate downgradient onto the ASKO parcel. This source contamination poses an ongoing recontamination risk to remediated areas on the downgradient ASKO parcel and may additionally impact performance of the downgradient in situ groundwater treatment barrier where TOCST has invested significant time, effort, and financial resources over the past 6 years in close coordination with Ecology to clean up the former Time Oil facility."	As mentioned in comments #1, #3, #6, and #7, there are no new or previously unidentified historical sources of impacts on the BNSF parcel. There is no evidence that the impacts on the ASKO Parcel are solely from the BNSF Property or are reflective of a changed condition on the BNSF Property and the most reasonable explanation is the RA completed on the adjacent property has liberated previously immobile CVOC mass.
17	"TOCST believes that the additional RI data provide sufficient information on the nature, extent, and migration of TCE-contaminated groundwater to demonstrate that an interim action by BNSF is warranted. In accordance with the Model Toxics Control Act, an interim action corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed (WAC 173-340-430(1)(b)). Given the ongoing migration of contaminated groundwater on portions of the ASKO parcel where cleanup action has already been completed, an immediate interim action is needed to correct the problem before it becomes substantially worse. The interim action, to be determined by Ecology and BNSF, would intercept and/or treat contaminated groundwater before it flows onto, and recontaminates, the ASKO parcel."	It is not evident that the remaining impacts on the ASKO Parcel are from the BNSF Property or caused by any changed condition on the BNSF Property or any action on the part of BNSF.