Evaluation of Sediment and Indoor Air Pathways

Chemtrade Performance Chemicals US LLC Site (aka Former Clariant Corporation Facility)

Kalama, Washington
Facility No. 24634187
VCP Project No. SW0492

H&H Job No. CLR-045
August 17, 2018

8/17/18

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Via FedEx & Email

August 17, 2018

Washington State Department of Ecology
Toxics Cleanup Program
300 Desmond Drive
Lacey, WA 98503

Attention: Mr. Adam Harris, LHG

Re: Evaluation of Sediment and Indoor Air Pathways
Chemtrade Performance Chemicals US LLC
Kalama, Washington
Facility No. 24634187
VCP Project No. SW0492
H&H Job No. CLR-045

Dear Adam:

1.0 Introduction

On behalf of Clariant Corporation (Clariant), Hart & Hickman, PC (H&H) is submitting this evaluation of the sediment and indoor air potential exposure pathways for the Chemtrade Performance Chemicals US LLC facility site (the Site) in Kalama, WA. Following submittal of our *Updated Conceptual Site Model* dated March 19, 2018 (CSM) and our *Summary of Proposed FS Cleanup Action Alternatives* dated April 24, 2018, the Washington State Department of Ecology (Ecology) issued an opinion letter dated July 5, 2018 (the Opinion) which includes requests for evaluation of the sediment and indoor air potential exposure pathways at the Site. Our evaluations of the pathways in response to Ecology's requests are presented in the following sections.

2.0 Sediment Evaluation

In the Opinion, Ecology requests use of the procedures provided in Washington Administrative Code (WAC) 173-204-510 to determine and report if impacts associated with the Site have resulted in a sediment site of potential concern. WAC 173-204-500 establishes requirements for identifying, investigating, and cleaning up a release or threatened release of a contaminant to sediment that may pose a threat to human health or the environment. Under this section, the initial step in the process for evaluation of potentially contaminated sediments is to identify sediment station clusters of potential concern in accordance with WAC 173-204-510.

WAC 173-204-510 indicates that Ecology shall analyze sediment sampling data to identify station clusters of potential concern and station clusters of low concern. Station clusters of potential concern shall be further evaluated using the hazard assessment standards of WAC 173-204-520. Station clusters of low concern shall remain on the inventory and no further cleanup action determinations shall be taken until/unless new information is available and the stations are reexamined per WAC 173-204-510(5). Per WAC 173-204-510(2), a station cluster is defined as any number of stations that are determined by the department to be spatially and chemically similar. In the Opinion, Ecology indicates that data for Site sediment sample locations SD-1 through SD-10 appear to support that the data set are chemically and spatially similar, and therefore may be defined as a station cluster for evaluation of potential sediment impacts under WAC 173-204. A summary of sediment analytical data for the Site is included in Table 1 and sediment sample locations are depicted in Figure 1.

Per WAC 173-204-510(2), for the purpose of identifying a station cluster of potential concern, three stations with the highest chemical concentration for any particular chemical or the highest degree of biological effects as identified in WAC 173-204-562 or WAC 173-204-563, as applicable, are selected for evaluation from a station cluster. WAC 173-204-562 is applicable to marine and low salinity sediments, and WAC 173-204-563 is applicable to freshwater sediment. The Columbia River is freshwater at the Site; therefore, the sediment cleanup levels presented in

WAC 173-204-563 are applicable to Site sediment. The following process is then used to identify station clusters of concern (or, to determine a station cluster is of low concern):

a) **Chemical Criteria.** Identify, if available, the three stations within a station cluster with the highest concentration of each chemical identified in WAC 173-204-563. For each chemical, determine the average concentration for the chemical at the three stations identified. If the average chemical concentration for any three stations exceeds the applicable chemical cleanup screening level in WAC 173-204-563, then the station cluster shall be defined as a station cluster of potential concern.

b) **Biological Criteria.** Identify, if available, three stations within the station cluster with the highest level of biological effects for the biological tests identified in WAC 173-204-563. If the level of biological effects at each of the three stations from this subsection exceeds the applicable cleanup screening level in WAC 173-204-563, then the station cluster shall be defined as a station cluster of potential concern.

c) **Human Health, Background, and Other Criteria.** A station cluster shall be defined as a station cluster of potential concern if Ecology determines that each of three stations within a station cluster exceed the following criteria:

(i) The applicable human health and regional background cleanup screening levels in WAC 173-204-560(4);
(ii) The other toxic, radioactive, biological, or deleterious substances criteria in WAC 173-204-563; or
(iii) The nonanthropogenically affected criteria of WAC 173-204-563.

Our evaluation of Site sediment data using the process above to determine if impacts associated with the Site have resulted in a sediment site of potential concern is presented below.

2.1 Chemical Criteria Evaluation

The sediment cleanup objectives (SCOs) presented in Table VI (Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria) of WAC 173-204-563 apply to freshwater sediments for toxicity to the benthic community and establish a no adverse effects level, including no acute or chronic effects, to the benthic community in freshwater sediment. For the sediment evaluation, the average chemical concentration for the three stations (discussed above) is compared to the applicable cleanup screening level presented in Table VI. If the average chemical concentration exceeds the applicable cleanup screening level in WAC 173-204-563, then the station cluster shall be defined as a station cluster of potential concern.

The chemicals of concern (COCs) associated with the Site are cadmium and zinc. The SCOs presented in Table VI for cadmium and zinc are 2.1 and 3,200 mg/kg, respectively. Cadmium has not been detected above laboratory method detection limits (MDLs) in sediment samples collected from the Site. The average of the highest three cadmium MDLs (0.773, 0.766, and 0.759 milligrams per kilogram – mg/kg) for sediment samples SD-1 through SD-10 is 0.766 mg/kg. The average of the highest three zinc detections (42.4, 34.1, 32.8 mg/kg) in sediment samples SD-1 through SD-10 is 36.4 mg/kg. The cadmium station average calculated from the MDLs of 0.766 mg/kg is lower than the Table VI SCO for cadmium (2.1 mg/kg), and the zinc station average of 36.4 mg/kg is significantly lower than the Table VI SCO for zinc (3,200 mg/kg). Therefore, the cadmium and zinc station clusters should not be defined as station clusters of potential concern based on toxicity to the benthic community in freshwater sediment.

2.2 Biological Criteria Evaluation

The biological effects criteria in Table VII of WAC 173-204-563 establish SCOs which apply to freshwater sediments for toxicity to the benthic invertebrate community. Biological testing of Site sediment has not been completed; therefore, data are not available for comparison to the Table VII biological effects criteria. However, we have identified two widely referenced

publications which document studies/evaluations performed to establish concentrations of contaminants (including cadmium and zinc) in sediment which are likely to have adverse biological effects on the benthic community.

The National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NOS OMA 52 entitled *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program* (NOAA 1991) documents the results of an assessment of the relative likelihood or potential for adverse biological effects occurring due to exposure of biota to toxicants in sediments. Note that data used in the study were gathered from a wide-range of geographical areas located in the United States. Results of the study indicate the low end of the range of concentrations in which biological effects were observed or predicted for cadmium and zinc are 5.1 and 121 mg/kg, respectively.

The Environmental Toxicology and Chemistry journal article entitled *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (CBSQG 2000a) documents development of consensus-based sediment quality guidelines (SQGs), including threshold effect concentrations (TECs) for contaminants including cadmium and zinc. The consensus-based TECs are intended to identify the concentrations of sediment-associated contaminants below which adverse effects on sediment-dwelling organisms are not expected to occur. The consensus-based TECs established by the evaluation for cadmium and zinc are 0.99 and 121 mg/kg, respectively. Note that this publication is referenced in Appendix A of the Northwest Regional Sediment Evaluation Team *Sediment Evaluation Framework for the Pacific Northwest* (RSET 2016).

Because the cadmium station MDLs and the zinc station concentrations are below concentrations likely to have adverse biological effects on the benthic community (referenced in the publications discussed above), we believe it is unlikely that cadmium and zinc in Site sediment pose a biological effect concern to the benthic invertebrate community. Also, please note that Ecology's Publication No. 12-09-057, *Sediment Cleanup User's Manual II* (SCUM II), indicates

that it may be necessary to conduct biological testing when there is an exceedance of the chemical benthic criteria for any one station. As previously discussed, cadmium and zinc concentrations do not exceed the chemical criteria in any stations. Based upon the information presented above, we do not believe that further evaluation of the potential biological effects associated with Site sediment is warranted and we recommend that the cadmium and zinc station clusters should not be defined as station clusters of potential concern based upon biological effects to the benthic invertebrate community.

2.3 Human Health, Background, and Other Criteria

Evaluation of sediment station clusters also includes comparison of stations to applicable human health and regional background cleanup screening levels (WAC 173-204-560(4)), other toxic, radioactive, biological, or deleterious substances criteria (WAC 173-204-563), and nonanthropogenically affected criteria (WAC 173-204-563). Our evaluations of Site sediments in comparison to these criteria are presented below.

2.3.1 Background Concentrations

Natural background concentrations can be used to identify clusters of low concern that do not need further investigation/evaluation, and regional background concentrations can be used for identifying clusters of potential concern as potential sediment cleanup sites or areas for potential further investigation and evaluation. Ecology has determined that a collective data set (referred to as Bold Plus) is appropriate to establish natural background for marine sediment, but Ecology has not established natural background for freshwater sediment (SCUM II). For reference, the calculated 90/90 Upper Tolerance Limit (UTL) marine sediment values for cadmium and zinc are 0.8 and 93 mg/kg, respectively. In addition, the statewide 90th percentile natural background concentrations of cadmium and zinc in surface soils are 1 and 86 mg/kg, respectively (as reported in Ecology's Publication No. 94-115, *Natural Background Soil Metals Concentrations in Washington State).*

During previous soil removal actions completed at the Site, Columbia River dredge spoils obtained from the Port of Kalama property located to the south of the Site were utilized as excavation backfill. The results of analysis of six samples collected from the backfill material indicate cadmium was not detected in the samples (the MDLs for five of the samples were 0.53 mg/kg and the MDL for the other sample was 2.05 mg/kg) and zinc was detected at concentrations ranging from 27 to 39.4 mg/kg (average of 34.1 mg/kg) in the six samples. It is likely that the backfill concentrations are generally representative of background concentrations in Columbia River sediments. Refer to the CSM for a summary of Site soil data.

As discussed in Section 2.1, the average of the highest three cadmium station MDLs is 0.766 mg/kg and the average of the highest three zinc station concentrations is 36.4 mg/kg. These concentrations are generally similar to cadmium MDLs and zinc concentrations in the Columbia River dredge spoils used as backfill at the Site, and are lower than the natural background concentrations for marine sediments and state-wide surface soils referenced above. Based upon these lines of evidence, it appears that the cadmium station MDLs and the zinc station concentrations are consistent with natural background concentrations.

2.3.2 Human Health

SCUM II indicates that, in terms of exposure to contaminants in sediment, risks to humans occur primarily through consumption of fish/shellfish, and therefore, contaminant concentrations in fish/shellfish tissue can play a critical roll in assessing risks and establishing risk-based sediment concentrations. SCUM II presents two options for determining risk-based sediment concentrations for bioaccumulative COCs. One of the options (Option 1) is an approach using sediment data only. The other option (Option 2) is an approach using fish/shellfish tissue data to calculate site-specific biota-sediment accumulation factors (BSAFs) which are used to back-calculate sediment concentrations from protective tissue concentrations. However, as SCUM II notes, collecting fish/shellfish tissue data can be a substantial effort that may not be necessary for smaller or less complex sites, and when only sediment data are available for a site, it is generally

not possible to calculate site-specific risk-based sediment concentrations. Both approaches meet Ecology's Sediment Management Standards (SMS) program requirements.

Option 1 includes the following two parts:

- Part 1 – using sediment background concentrations (natural and regional) as SCOs and cleanup screening levels protective of human health (and, higher trophic levels) based on the fish/shellfish consumption exposure pathway. This is appropriate because risk-based sediment concentrations back-calculated from BSAFs are frequently below background, resulting in the final SCO defaulting to background (because cleanup below background is not feasible).

- Part 2 – calculating risk-based SCOs based on secondary exposure pathways (direct contact with and incidental ingestion of sediment). Secondary exposure pathways typically result in higher risk-based concentrations than fish/shellfish consumption exposure pathway concentrations. Therefore, where both the secondary and fish/shellfish consumption exposure pathways are applicable, calculation of SCOs for the secondary exposure pathways is not necessary. However, for reference, the lowest human health risk-based concentrations for the secondary exposure pathways calculated using the spreadsheet in SCUM II Appendix K for cadmium and zinc are 640 and 121,000 mg/kg, respectively.

As discussed in Section 2.3.1 above, background concentrations have not been established by Ecology for freshwater sediments; however, based upon multiple lines of evidence, it appears that the cadmium station MDLs and the zinc station concentrations are consistent with natural background concentrations. Because background concentrations can be used as SCOs protective of human health and cadmium station MDLs and zinc station concentrations are significantly lower than calculated risk-based SCOs based on secondary exposure pathways, we believe the cadmium and zinc station clusters should not be defined as station clusters of potential concern

based upon potential risks to human health (or, higher trophic levels).

2.3.3 Other Criteria

WAC 173-204-563(4) defines "other toxic, radioactive, biological, or deleterious substances" as substances not specified in Table VI that are in, or on, sediments and cause minor adverse effects to biological resources. The COCs associated with the Site (cadmium and zinc) are included in Table VI and there are no other known toxic, radioactive, biological, or deleterious substances associated with the Site or Site sediments. In addition, there are no nonanthropogenically affected criteria (e.g., established site-specific chemical criteria where sediment or sediment with pore water or overlying water has unusual geochemical or biochemical characteristics influencing toxicity) applicable to Site sediments. Therefore, it appears that the cadmium and zinc station clusters should not be defined as station clusters of potential concern based on other toxic, radioactive, biological, deleterious substances, or nonanthropogenically affected criteria

2.4 Sediment Evaluation Summary

In the Opinion, Ecology indicates that data for Site sediment sample locations SD-1 through SD-10 appear to support that the data set are chemically and spatially similar, and therefore may be defined as a station cluster for determination of sediment impacts under WAC 173-204. Based upon our evaluation of the station cluster:

- The cadmium and zinc station average concentrations are lower than chemical criteria SCOs presented in Table VI of WAC 173-204-563.

- Biological testing of Site sediment has not been completed; therefore, data are not available for comparison to biological effects criteria presented in Table VII of WAC 173-204-563. However, cadmium and zinc station concentrations are lower than published concentrations likely to have adverse biological effects on the benthic

community. Further evaluation of biological effects associated with Site sediment does not appear warranted.

- Cadmium and zinc station concentrations are consistent with natural background concentrations. Because background concentrations could be used as SCOs protective of human health (and, higher trophic levels) based on the fish/shellfish consumption exposure pathway, and because cadmium and zinc station concentrations are significantly lower than risk-based SCOs based on secondary exposure pathways, it does not appear that Site sediments pose an unacceptable risk to human health or higher trophic levels.

- There are no other known toxic, radioactive, biological, or deleterious substances associated with the Site or Site sediments and there are no nonanthropogenically affected criteria applicable to Site sediments.

Based upon our evaluation of Site sediment data in accordance with WAC 173-204-510, the Site sediment station cluster should be designated a station cluster of low concern, and no further cleanup action determinations are currently warranted for Site sediments.

3.1 Indoor Air Evaluation

In the Opinion, Ecology requests that evaluation of the potential for indoor air impacts at the Site be completed using a tiered approach based on Ecology's Publication No. 09-09-047, *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remediation*, Revised February 2016 and April 2018 (VI Guidance). The VI Guidance recommends a tiered approach to vapor intrusion (VI) assessment. The initial step in the tiered approach is to determine if a potential exists for toxic vapors to be present in the subsurface that could migrate into buildings. According to the VI Guidance, in order to pose a potential VI threat to indoor air, COCs must be both volatile and toxic enough to contaminate soil gas to unacceptable levels. Appendix B of the VI Guidance contains a list of substances that could potentially contaminate

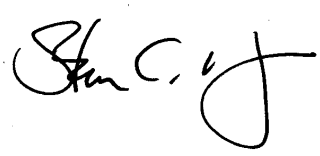
indoor air to unacceptable levels via the VI pathway. The Site COCs cadmium and zinc are not included in Appendix B of the VI Guidance. Furthermore, cadmium and zinc are inorganic, non-volatile metals which are not known to pose a potential concern via the VI pathway. The VI Guidance indicates that if chemicals of sufficient volatility and toxicity are not known or reasonably suspected to be present in the subsurface, there is no subsurface VI source and no need to conduct further investigation to assess the pathway. (The VI Guidance notes that Appendix B does not include every chemical that could potentially contaminate soil gas and indoor air, and Ecology may identify circumstances where it becomes necessary to consider the volatility and toxicity of chemicals not included in the appendix.)

Based upon our review of the VI Guidance and the information presented above, it does not appear that additional evaluation of the VI pathway is warranted at the Site.

Clariant requests that Ecology provide comment on the findings of the sediment and indoor air evaluations presented above. If you have any questions or need additional information, please feel free to contact us at (704) 586-0007.

Sincerely,

Hart & Hickman, PC



Scott Drury
Project Manager

Steven C. Hart, LG
Principal

Attachment

cc: Gil Insley – Clariant (via email)

Table 1
Summary of Sediment Analytical Data
Chemtrade Performance Chemicals US LLC Site
Kalama, WA
H&H Project No. CLR-045

Sample ID	Sample Date	Cadmium (mg/kg)	Zinc (mg/kg)
SED AB1-A	07/21/15	<1.24	47.9
SED AB1-B	07/21/15	<1.29	44.5
SED AB1-C	07/21/15	<1.25	61.9
SED AB2-A	07/21/15	<1.27	55.1
SED AB2-B	07/21/15	<1.22	35.1
SED AB2-C	07/21/15	<1.08	51.7
SED-US (Background)	07/22/15	<1.20	31.1
SED-DS	07/22/15	<1.28	27.4
SD-1	08/11/17	<0.545	16.9
SD-2	08/11/17	<0.773	34.1
SD-3	08/11/17	<0.766	32.8
SD-4	08/11/17	<0.745	26.8
SD-5	08/11/17	<0.669	26.8
SD-6	08/11/17	<0.759	42.4
SD-7	08/11/17	<0.651	17.6
SD-8	08/11/17	<0.624	18.0
SD-9	08/11/17	<0.608	16.2
SD-10	08/11/17	<0.751	26.9
SD-US (Background)	08/11/17	<1.26	250
SD-DS	08/11/17	<0.529	17.8
	Sediment CUL[1]	**2.1**	**3,200**

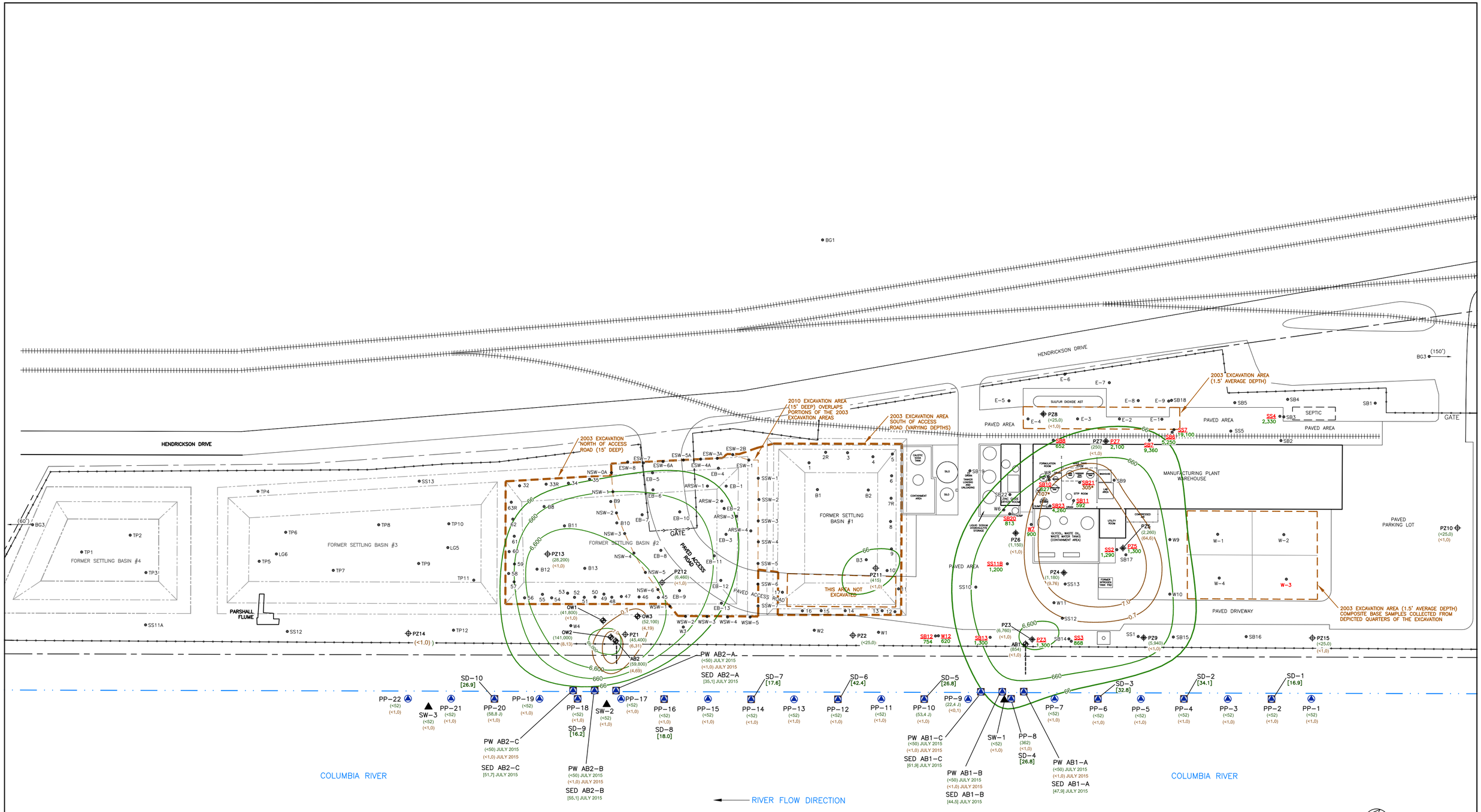
Notes:

mg/kg = milligrams per kilogram

"<" indicates not detected (non-detect values for the 2017 samples are method detection limit (MDL) and are method reporting limits (MRLs) for the 2015 samples

Samples were analyzed by EPA Method 6010/6020 for cadmium and zinc only

[1]Sediment cleanup levels (CULs) are the Freshwater Sediment Cleanup Objectives from Table VI of Washington Administrative Code (WAC) 173-204-563 Sediment Management Standards.



LEGEND

- PROPERTY LINE
- FENCE LINE
- APPROXIMATE EAST EDGE OF COLUMBIA RIVER
- RAILROAD TRACK
- EXTENT OF FORMER SETTLING BASIN (FSB)
- PERIMETER OF FORMER SOIL EXCAVATION
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- PUSHPOINT GROUNDWATER SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- SOIL SAMPLE LOCATION
- PZ5 SOIL SAMPLE LOCATION WITH ZINC/CADMIUM ABOVE ECOLOGICAL CUL (SEE NOTE 4)
- SEDIMENT SAMPLE LOCATION (AT PUSHPOINT SAMPLE LOCATION)
- 627 ZINC CONCENTRATION IN SOIL (mg/kg)
- 107* CADMIUM CONCENTRATION IN SOIL (mg/kg)
- (6,460) ZINC CONCENTRATION IN GROUNDWATER µg/L
- 660 INFERRED ZINC ISOCONCENTRATION CONTOUR IN µg/L
- (4,19) CADMIUM CONCENTRATION IN GROUNDWATER IN µg/L
- 0.7 INFERRED CADMIUM ISOCONCENTRATION CONTOUR IN µg/L
- [26.9] ZINC CONCENTRATION IN SEDIMENT (mg/kg)

NOTES
1. SOIL SAMPLE LOCATIONS ARE FROM SOIL WHICH REMAINS IN PLACE AT THE SITE AFTER COMPLETION OF EXCAVATION ACTIVITIES. SOIL SAMPLE LOCATIONS WHICH WERE REMOVED BY EXCAVATION ACTIVITIES ARE NOT DEPICTED.
2. IMPORTED COLUMBIA RIVER DREDGE SPOILS OBTAINED FROM ADJACENT PROPERTY SOUTH OF THE SITE WERE USED TO BACKFILL EXCAVATIONS.
3. SAMPLES OB1 THROUGH OB4, SB1-SURF-1/2/3/4, AND SB2-SURF-1/2/3/4 REPRESENT SOIL WITHIN THE EXTENTS OF FSB1 AND FSB2, BUT EXACT LOCATIONS ARE NOT KNOWN AND THE SAMPLES ARE NOT DEPICTED.
4. ONLY ZINC AND CADMIUM CONCENTRATIONS DETECTED IN SOIL SAMPLES ABOVE ECOLOGICAL CLEANUP LEVELS (CULs) OF 36 AND 570 MILLIGRAMS PER KILOGRAM (mg/kg), RESPECTIVELY (WAC 173-340-900 TABLE 749-2 VALUES FOR INDUSTRIAL/COMMERCIAL SITES) ARE DEPICTED, AND ONLY THE MAXIMUM CONCENTRATION DETECTED WITHIN THE STANDARD POINT OF COMPLIANCE IN A BORING (0-15 FT) IS DEPICTED.
5. *CADMIUM WAS DETECTED ABOVE THE UNRESTRICTED LAND USE SOIL-DIRECT CONTACT CLEANUP LEVEL (80 mg/kg) CURRENTLY APPLICABLE TO THE SITE IN SB10 AND SB21 ONLY. ZINC WAS NOT DETECTED IN ANY REMAINING SOIL SAMPLES ABOVE THE UNRESTRICTED LAND USE SOIL-DIRECT CONTACT CLEANUP LEVEL (24,000 mg/kg) CURRENTLY APPLICABLE TO THE SITE.
6. SAMPLE DATA ARE FROM AUGUST 2017 UNLESS INDICATED OTHERWISE.
7. µg/L = MICROGRAMS PER LITER
8. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.
9. CADMIUM WAS NOT DETECTED IN ANY SEDIMENT SAMPLES.

TITLE: COMBINED MEDIA SAMPLE LOCATIONS AND IMPACTS OVERLAY MAP

PROJECT: CHEMTRADE PERFORMANCE CHEMICALS SITE
FACILITY/SITE No. 24634187
KALAMA, WA

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DATE: 08-01-18	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 1