MEMORANDUM

To:	Katie Daugherty, RG	Date:	February 27, 2024
From:	Phil Wiescher, PhD Tim Browning, RG	Project No.:	M8012.01.001
RE:	Updated Topsoil Source Evaluation and Proposed Residential Preliminary Remediation Goal for Dioxins/Furans		

Maul Foster & Alongi, Inc. (MFA) and Permapost Products, Inc. (Permapost) have prepared this memorandum to summarize the results of the topsoil source sampling for the Permapost property in Hillsboro, Oregon (the Site). This sampling was conducted to characterize topsoil source material appropriate for backfill use[1] for residential yard remediation. Characterization of regional topsoil source dioxin/furan concentrations was conducted at the request of the Oregon Department of Environmental Quality (DEQ) to support preliminary remediation goal (PRG) development for Site residential yards. Sampling was initially conducted at four topsoil providers in May and July 2023, and results were provided to DEQ in a memorandum (MFA 2023c). DEQ approved a PRG of 11.8 pg/g (picograms per gram) and provided the option to conduct additional topsoil sampling. Based on the DEQ comments, Permapost conducted sampling for four additional topsoil providers in November 2023. This memorandum presents the full topsoil source dataset and updated analyses to inform interim remedial action measure planning for the residential yards. Conceptual yard remediation areas based on the proposed PRG and analysis of the yard results are provided for review to inform ongoing outreach to yard homeowners and interim remedial action measure development (see Figure).

PRELIMINARY REMEDIATION GOALS

Chemicals of concern (COCs) for human health and ecological receptors were previously identified and summarized for multiple pathways (Permapost 2019; MFA 2023a). Based on the COCs and the pathways of concern, corresponding human health and ecological PRGs were proposed for multiple Site areas, except the residential pathway, as further described in the *Draft Feasibility Study Work Plan* (MFA 2023b). This memo provides a proposed site-specific PRG for dioxins/furans for Site residential yards based on topsoil source sampling completed in May, July, and November 2023.

TOPSOIL SAMPLING AND RESULTS

Topsoil source sampling was conducted consistent with the *Revised Yard Pre-Design Investigation Work Plan* (MFA 2023a) between May and November 2023. To identify providers for sampling, Permapost

[1] Soils that include the necessary texture and composition to support vegetative growth.

considered their location (i.e., are they reasonably proximate to the Site) and whether the provider typically can provide adequate soil volume to support Site yard remediation. Topsoil blends (often described as "3-ways") were then sampled from eight regional providers identified. The blends typically consisted of sandy loam, sand, and compost that could provide adequate drainage and support vegetative growth. One ten-point composite sample per source provider was collected and analyzed for dioxins/furans. Composite sampling was done to obtain an average representative concentration in the soil. An analytical summary table for the validated topsoil source results is included in the attached Table.

TOPSOIL RESULTS EVALUATION AND PROPOSED RESIDENTIAL AREA PRG

Concentrations of dioxins/furans toxicity equivalent (TEQ) in the topsoil were identified at up to 11.8 pg/g, which is more than two times the default residential risk-based concentration (see Table 1). Six of the eight topsoil sources (75 percent) contained concentrations of dioxins/furans above the residential risk-based concentration of 4.7 pg/g.

A soil background threshold value (BTV) was calculated consistent with ITRC (2021) and EPA (2015) guidance. BTV is defined as an upper threshold of a background population, so that only a small portion of background concentrations exceed the threshold value, such as a 95th or 99th percentile of the distribution of the background population. In most practical applications, choice of a 95th percentile BTV provides a good compromise between confidence and power (ITRC 2021). Values commonly used to represent BTVs include the upper prediction limit (UPL), the upper tolerance limit (UTL), and the upper simultaneous limit (USL) and a minimum of eight samples for calculation is generally recommended. Each BTV has strengths and weaknesses depending on the nature of the data collected, and there is no general consensus among practitioners about the statistic that should be used to estimate a BTV. For the UPL, small background datasets (<50 measurements) with multiple subpopulations for point-by-point comparisons can lead to excessive false positive error rates. A UTL 95-95 is designed to simultaneously provide coverage for 95 percent of all potential observations from the background population with a confidence of 95 percent. A UTL 95-95 can be used when many observations need to be compared with a BTV. Like a UTL, a USL is used when any number (small or large) of on-site observations are compared with a BTV. Unlike a UTL, a USL does not assume a priori that a certain percentage of background observations do not belong to the background population and tends to provide a balance between false positives and false negatives provided the data are representative. Depending upon the variability of the background data, the BTV statistics may exceed the largest value in the background dataset (EPA 2015).

EPA software (ProUCL) was used to conduct BTV calculations. The analysis showed a normal data distribution, and resulting UPL (12.5 pg/g), UTL (16.5 pg/g), and USL (12.6 pg/g) values were calculated based on the assumption of normality (see Attachment A).

Other factors that support the use of a BTV to reasonably represent the regional topsoil dioxin/furan concentrations include:

- 75 percent of the samples collected exceeded the DEQ default residential risk-based concentration.
- The sampling conducted demonstrated significant variability in dioxin/furan concentration, indicating that concentrations in topsoil will fluctuate depending on multiple factors such as the soil source, soil provider processing procedures, timing of soil procurement, etc.
- At all soil provider facilities, soil turnover (i.e., import and export of soil) is continuous making it uncertain what soil concentrations will be at the point in time when acquired. In addition, pre-testing soil source material is difficult since significant soil turnover would occur between the testing date and receipt of analytical results (currently approximately 8 weeks for dioxin/furans). Soil testing following purchase is not an acceptable strategy as this could result in the rejection of soil and associated costs with sourcing new soil and the transport and disposal of the rejected soil.
- The BTVs are comparable with the risk-based direct contact criteria developed by Washington state and is significantly lower than other risk-based remediation goal criteria developed by California:
  - **Washington:** The Washington State Model Toxics Control Act Method B criteria for dioxin/furans (2,3,7,8-TCDD) is 13 pg/g. This value is provided in the Washington State Department of Ecology Cleanup Levels and Risk Calculation database issued August 2023.
  - **California:** The remedial goal for residential exposure scenarios in soil for dioxin/furans is 50 pg/g (CDTSC 2017).

Given the significant variability of dioxin/furan concentrations observed at regional topsoil providers and continuous soil turnover, it is recommended that a site-specific PRG of 16.5 pg/g based on the 95 UTL-UTL is applied for residential areas of the Site in consideration of technical implementability.

YARD CLEANUP AREAS

Based on the proposed PRG, conceptual yard remediation areas were developed as shown in the Figure. Exposure concentrations were developed for each property for the residential yard exposure depths of zero to 3 feet bgs for comparison with the PRG. Exposure concentrations were also developed for 1 to 3 feet bgs for comparison with the PRG, to evaluate scenarios in which the top 1 foot would be removed. Exposure concentrations for the depth interval of interest are based on the average of samples collected for the surface and subsurface in yard areas sampled (frontyard, midyard, and/or backyard). DU-05 surface ISM results span all three yards and were therefore not incorporated. All comparison and calculations were conducted for dioxin/furans as shown in Table 2.

Table 2 summarizes cleanup depths for areas of all three properties evaluated as also shown in the Figure. The cleanup depths were also evaluated relative to arsenic exceedances observed as part of

yard sampling, and account for all exceedances of the arsenic background criterion. The full yard investigation results dataset is provided in Table 3 for reference. Permapost requests review of the conceptual remediation areas as this will inform additional outreach and discussion with homeowners regarding yard cleanups.

ATTACHMENTS

Tables 1 through 3
Figure—Conceptual Remediation Areas
A—EPA ProUCL Output

REFERENCES

CDTSC. 2017. *Human Health Risk Assessment Note Number 2. Issue: Soil Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites.* California Department of Toxic Substances Control, Human and Ecological Risk Office. April.

EPA. 2015. *ProUCL Version 5.1 Technical Guide, Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations.* U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC, (EPA/600/R07/041).

ITRC. 2021. *Soil Background and Risk Assessment.* Washington, D.C.: Interstate Technology & Regulatory Council. www.itrcweb.org. December.

MFA. 2023a. P. Wiescher and C. Wise, Maul Foster & Alongi. *Revised Yard Pre-Design Investigation Work Plan, Permapost Products, Inc., Hillsboro, Oregon, ECSI #148,* Memorandum, K. Daugherty, Oregon Department of Environmental Quality. April 11.

MFA. 2023b. J. Elliot, Maul Foster & Alongi, J. Maul, Gemini Environmental Strategies, T. Browning, Permapost Products, Inc., *Draft Feasibility Study Work Plan, Permapost Products, Inc.,* Memorandum, K. Daugherty, Oregon Department of Environmental Quality. August 31.

MFA. 2023c. P. Wiescher, Maul Foster & Alongi, T. Browning, Permapost Products, Inc., *Topsoil Source Evaluation and Proposed Residential Preliminary Remediation Goal for Dioxin/Furans.*, Memorandum, K. Daugherty, Oregon Department of Environmental Quality. October 6.

Permapost. 2019. *RCRA Permit-Focused Remedial Investigation Report, Permapost Products, Inc.* (ORD 009 041 187) (ECSI #148). Prepared by Permapost Products, Inc., Hillsboro, Oregon. June 25.

TABLES

Table 1
Summary of Topsoil Source Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Location:	RBC, Soil Ingestion, Dermal Contact, and Inhalation, Residential[1]	PP-1	PP-2	PP-3	PP-4	PP-5	PP-6	PP-7	PP-8
Sample Date:		05/26/2023	05/26/2023	05/26/2023	07/18/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Sample Depth (ft bgs):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Total Metals (mg/kg)									
Arsenic	8.8[a][2]	--	--	--	2.64	3.06	2.25 U	2.73	3.59
Dioxins and Furans (pg/g)									
1,2,3,4,6,7,8-HpCDD	NV	234 J	55.0 J	548 J	188 J	207 J	202 J	22.1 J	135 J
1,2,3,4,6,7,8-HpCDF	NV	26.3 J	6.12 J	29.2 J	24.8 J	18.8 J	20.8 J	4.74 J	29.2 J
1,2,3,4,7,8,9-HpCDF	NV	1.75 J	0.544 UJK	2.81 J	1.79 J	2.18 J	2.02 J	0.370 UJ	2.09 J
1,2,3,4,7,8-HxCDD	NV	1.59 J	0.608 UJ	1.43 J	1.33 J	1.77 UJ	1.07 J	0.372 UJ	1.05 J
1,2,3,4,7,8-HxCDF	NV	2.45 J	0.531 J	2.84 J	2.37 J	2.14 J	2.01 J	0.312 J	2.45 J
1,2,3,6,7,8-HxCDD	NV	8.05 J	1.56 J	10.5 J	5.43 J	5.20 J	5.54 J	1.34 J	5.40 J
1,2,3,6,7,8-HxCDF	NV	1.45 J	0.297 J	1.91 J	1.31 J	1.40 J	1.27 J	0.212 UJK	1.53 J
1,2,3,7,8,9-HxCDD	NV	3.68 J	0.821 J	4.42 J	2.45 J	1.76 UJ	2.61 J	0.390 UJK	2.31 J
1,2,3,7,8,9-HxCDF	NV	0.398 J	0.227 UJ	0.849 J	0.191 UJK	1.13 UJ	0.167 UJK	0.253 UJ	0.302 J
1,2,3,7,8-PeCDD	NV	1.22 J	0.324 UJK	0.982 J	0.980 J	0.885 UJ	0.549 UJK	0.288 UJ	0.683 UJK
1,2,3,7,8-PeCDF	NV	0.699 J	0.107 UJ	0.708 J	0.361 UJK	0.697 UJ	2.00 J	0.182 UJ	0.530 J
2,3,4,6,7,8-HxCDF	NV	1.13 J	0.239 J	2.37 J	1.44 J	1.56 J	2.11 J	0.227 UJK	1.79 J
2,3,4,7,8-PeCDF	NV	1.74 J	0.249 J	1.96 J	1.18 J	1.32 UJK	2.05 J	0.182 UJK	2.35 J
2,3,7,8-TCDD	NV	0.294 UJK	0.0675 UJ	0.290 UJK	0.218 UJK	0.436 UJ	0.316 UJK	0.127 UJK	0.748 J
2,3,7,8-TCDF	NV	0.930 UJK	0.102 UJ	0.498 J	0.333 J	0.501 UJ	12.4 J	0.131 UJ	0.488 UJK
OCDD	NV	2,790 J	633 J	5,900 J	2,310 J	2,400 J	2,180 J	191 J	1,520 J
OCDF	NV	85.6 J	23.2 J	86.6 J	73.4 J	48.6 J	56.2 J	9.38 J	80.9 J
Total HpCDDs	NV	543 J	110 J	1,420 J	390 J	494 J	478 J	44.1 J	268 J
Total HpCDFs	NV	91.9 J	23.8 JK	102 J	76.3 J	63.3 J	67.9 J	14.5 J	95.3 J
Total HxCDDs	NV	58.2 JK	11.2 JK	91.7 J	37.8 JK	51.4 J	56.2 J	9.28 JK	36.5 J
Total HxCDFs	NV	49.9 J	9.35 J	49.6 J	39.8 JK	34.4 JK	35.9 JK	7.52 JK	49.6 JK
Total PeCDDs	NV	14.1 JK	2.24 UJK	13.3 JK	7.52 JK	3.23 UJK	8.19 UJK	1.28 UJK	8.53 UJK
Total PeCDFs	NV	17.1 J	2.55 JK	18.6 J	12.8 JK	7.49 UJK	13.4 J	1.89 UJK	28.8 JK
Total TCDDs	NV	4.66 UJK	0.205 J	3.09 UJK	2.11 UJK	0.436 UJ	2.12 UJK	0.332 UJK	2.69 JK
Total TCDFs	NV	10.1 UJK	0.102 UJ	9.71 JK	6.59 JK	0.559 J	21.1 JK	0.221 J	17.0 UJK
Dioxin and Furan TEQ[b][3]	4.7	7.31 J	1.47 J	11.8 J	5.79 J	5.17 J	6.74 J	0.812 J	5.46 J

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Table 1
Summary of Topsoil Source Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Notes

Shading indicates values that exceed screening criteria; non-detects (U,UJ, UJK) were not compared with screening criteria.

-- = not analyzed.

ft bgs = feet below ground surface.

J = result is estimated.

JK = result is estimated and an estimated maximum potential concentration.

NV = no value.

mg/kg = milligrams per kilogram.

pg/g = picograms per gram.

RBC = risk-based concentration.

TEQ = toxicity equivalency.

U = result is non-detect at the method reporting limit.

UJ = result is non-detect with an estimated detection limit.

UJK = result is non-detect, an estimated value, and an estimated maximum potential concentration.

[a]Oregon background concentration, Portland Basin.

[b]Dioxin and furan TEQ is calculated as the sum of each detected congener concentration multiplied by the corresponding TEF value. Non-detect congeners are also multiplied by one-half.

References

[1]DEQ. 2023. Table: *Risk-Based Concentrations for Individual Chemicals.* Oregon Department of Environmental Quality. June.

[2]DEQ. 2013. *Development of Oregon Background Metals Concentrations in Soil* . Oregon Department of Environmental Quality, Land Quality Division Cleanup Program, Portland, Oregon. March.

[3]Van den Berg et al. 2006. "The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds." *Toxicological Sciences.* 93(2): 223–241.

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Table 2
Cleanup Depth Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Property 1						
Depth	Front		Mid		Back	
0-1 ft	DU1-A	16.0	DU1-B	27.5	DU-01[a]	45.7
1-2 ft	HA-19	5.11	HA-23	15.7	HA-16	74.1
	HA-24	23.6	--	--	HA-22	21.4
2-3 ft	HA-24	2.9	HA-23	17	HA-16	18.3
	--	--	--	--	HA-22	28.9
Exposure Concentration (0-3 feet)	11.9		**20.1**		**37.7**	
Exposure Concentration (1-3 feet)	10.5		16.4		**35.7**	
Cleanup Depth	NA		1 ft		3 ft	
Property 2						
Depth	Front		Mid		Back	
0-1 ft	DU2-A	71.7	DU2-B	80.2	DU-02[a]	80.2
1-2 ft	HA-20	9.8	HA-26	6.3	HA-17	6.6
	HA-27	26.7	--	--	HA-25	7.6
2-3 ft	HA-27	7.9	HA-26	18.4	HA-17	--
	--	--	--	--	HA-25	3.96
Exposure Concentration (0-3 feet)	**29.0**		**35.0**		**24.6**	
Exposure Concentration (1-3 feet)	14.8		12.4		6.1	
Cleanup Depth	1 ft		1 ft		1 ft	
Property 3						
Depth	Front		Mid/Back			
0-1 ft	DU-03[b]	375	DU-03[b]	375		
1-2 ft	HA-21	26.1	HA-18	506		
	HA-29	--	HA-28	--		
2-3 ft	HA-21	73.3	HA-18	91.3		
	HA-29	29.2	HA-28	53.1		
Exposure Concentration (0-3 feet)	**126**		**256**			
Exposure Concentration (1-3 feet)	**42.9**		**217**			
Cleanup Depth	3 ft		3 ft			

Notes:

All results shown are for dioxins/furans measured as dioxin toxicity equivalent in picograms per gram.

Bolded results indicate exceedances of the preliminary remedial goal.

a = Result based on highest observed surface ISM sample concentration for the yard.

b = Result based on the average of the whole yard triplicate surface ISM sample concentration.

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Table 3
Summary of Soil Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Decision Unit:	Screening Criteria	DU-01								
Sample Name:		DU01-S-0.5	HA19-S-2.0	DU1-A	DU1-B	HA-22-Comp-1-2	HA-22-COMP-2-3	HA-23-COMP-1-2	HA-23-COMP-2-3	HA-24-COMP-1-2
Sample Date:		10/05/2022	10/05/2022	05/09/2023	05/09/2023	05/11/2023	05/11/2023	05/11/2023	05/11/2023	05/11/2023
Sample Depth (ft bgs):		0-0.5	1.0-2.0	0-0.5	0-0.5	1.0-2.0	2.0-3.0	1.0-2.0	2.0-3.0	1.0-2.0
Total Metals (mg/kg)										
Arsenic	8.8[a][1]	10.0	5.58	6.21	7.75	9.25	12.2	--	--	--
Dioxins and Furans (pg/g)										
1,2,3,4,6,7,8-HpCDD	NV	1,530	191	541 J	979 J	814 J	1,130 J	617 J	676 J	986 J
1,2,3,4,6,7,8-HpCDF	NV	250	30.9	82.7 J	153 J	120 J	167 J	79.7 J	88.5 J	138 J
1,2,3,4,7,8,9-HpCDF	NV	17.9	3.13 J	5.22 J	8.36 J	8.55 J	11.2 J	5.93 J	6.69 J	8.50 J
1,2,3,4,7,8-HxCDD	NV	13.7	1.77 J	4.03 J	6.53 J	5.71 J	7.31 J	4.11 J	4.21 J	5.96 J
1,2,3,4,7,8-HxCDF	NV	13.6	2.20 J	4.10 J	5.99 J	5.92 J	8.08 J	4.49 J	4.6 J	6.92 J
1,2,3,6,7,8-HxCDD	NV	69.2	9.53	19.7 J	31.7 J	33.8 J	44.9 J	23.1 J	23.7 J	32.5 J
1,2,3,6,7,8-HxCDF	NV	11.4	1.99 J	3.16 J	5.73 J	6.33 J	8.42 J	4.36 J	4.21 J	6.17 J
1,2,3,7,8,9-HxCDD	NV	33.2	4.33 J	9.40 J	13.5 J	13.7 J	17.4 J	9.24 J	9.62 J	14.2 J
1,2,3,7,8,9-HxCDF	NV	0.860 J	0.150 U	0.609 J	0.451 UJK	0.514 J	2.29 J	0.722 J	1.55 J	0.886 UJK
1,2,3,7,8-PeCDD	NV	5.56	0.300 U	2.07 J	2.46 J	2.56 J	3.48 J	2.09 J	2.14 J	2.14 J
1,2,3,7,8-PeCDF	NV	2.57 J	0.620 J	0.787 J	1.16 J	1.53 J	1.99 J	1.36 J	1.12 UJK	1.58 J
2,3,4,6,7,8-HxCDF	NV	6.40	1.07 J	1.18 J	2.98 J	2.49 J	5.76 J	1.65 J	2.57 J	3.56 UJK
2,3,4,7,8-PeCDF	NV	2.64 J	0.320 J	1.33 J	2.13 J	2.81 J	2.61 J	1.85 J	1.86 J	2.59 J
2,3,7,8-TCDD	NV	3.07	0.240 U	1.81 J	4.04 J	0.106 UJK	0.241 UJK	0.207 UJK	0.171 UJ	0.655 J
2,3,7,8-TCDF	NV	0.830 J	0.180 U	0.318 UJK	0.470 J	0.391 UJK	0.475 J	0.335 J	0.264 UJK	0.438 J
OCDD	NV	10,600	1,160	3,780 J	6,990 J	4,980 J	5,930 J	3,390 J	4,520 J	5,790 J
OCDF	NV	573	67.7	182 J	310 J	268 J	389 J	205 J	258 J	355 J
Total HpCDDs	NV	2,430	299	881 J	1,590 J	1,300 J	1,790 J	980 J	1,070 J	1,550 J
Total HpCDFs	NV	690	95.3	231 J	455 J	353 J	519 J	276 JK	310 J	441 J
Total HxCDDs	NV	257	28.3	83.9 J	140 J	119 J	166 J	85.4 J	88.8 J	124 J
Total HxCDFs	NV	283	47.4	98.5 JK	171 JK	193 JK	248 J	129 J	129 J	185 JK
Total PeCDDs	NV	13.3	0.210 U	8.82 JK	10.2 JK	7.39 JK	9.83 JK	4.93 JK	4.16 JK	6.32 JK
Total PeCDFs	NV	61.0	1.80 J	19.4 J	30.9 J	45.0 JK	70.3 J	36.8 JK	32.8 JK	42.6 JK
Total TCDDs	NV	3.07	0.24 U	3.46 JK	4.96 JK	0.492 UJK	0.528 UJK	0.471 UJK	0.171 UJ	0.845 J
Total TCDFs	NV	4.09	0.180 U	2.06 UJK	2.54 JK	3.05 UJK	3.90 JK	2.56 JK	3.01 UJK	2.82 JK
Dioxin and Furan TEQ[b][2]	11.8[c][3]	45.7 J	5.11 J	16.0 J	27.5 J	21.4 J	28.9 J	15.7 J	17.0 J	23.6 J

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Table 3
Summary of Soil Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Decision Unit:	Screening Criteria	DU-01 (cont.)	DU-02							
Sample Name:		HA-24-COMP-2-3	DU02-S-0.5	HA20-S-2.0	DU2-A	DU2-B	HA-25-Comp-1-2	HA-25-COMP-2-3	HA-26-COMP-1-2	HA-26-COMP-2-3
Sample Date:		05/11/2023	10/05/2022	10/05/2022	05/09/2023	05/09/2023	05/11/2023	05/11/2023	05/11/2023	05/11/2023
Sample Depth (ft bgs):		2.0-3.0	0-0.5	1.0-2.0	0-0.5	0-0.5	1.0-2.0	2.0-3.0	1.0-2.0	2.0-3.0
Total Metals (mg/kg)										
Arsenic	8.8[a][1]	--	7.99	--	--	--	--	--	--	--
Dioxins and Furans (pg/g)										
1,2,3,4,6,7,8-HpCDD	NV	104 J	911	337 J	2,750 J	3,220 J	298 J	149 J	242 J	807 J
1,2,3,4,6,7,8-HpCDF	NV	14.2 J	158	62.0	475 J	472 J	47.3 J	22.1 J	32.0 J	111 J
1,2,3,4,7,8,9-HpCDF	NV	1.56 UJK	11.3	5.31	27.7 J	29.9 J	3.28 J	1.66 J	2.68 J	8.36 J
1,2,3,4,7,8-HxCDD	NV	0.709 J	9.13	2.93 J	18.6 J	19.8 J	2.30 J	1.12 UJK	1.75 UJK	4.80 J
1,2,3,4,7,8-HxCDF	NV	0.815 J	10.4	3.28 J	24.4 J	20.4 J	2.14 J	1.22 J	1.76 J	4.87 J
1,2,3,6,7,8-HxCDD	NV	4.13 J	40.0	16.9	101 J	117 J	11.1 J	5.87 J	9.41 J	24.7 J
1,2,3,6,7,8-HxCDF	NV	0.812 J	7.27	3.09 J	17.3 J	16.7 J	2.35 J	1.28 J	1.49 J	4.04 J
1,2,3,7,8,9-HxCDD	NV	1.83 J	23.8	9.11	46.3 J	45.8 J	5.06 J	2.48 J	4.64 J	10.5 J
1,2,3,7,8,9-HxCDF	NV	0.218 UJK	0.400 U	0.210 U	3.80 J	2.24 J	0.402 UJ	0.211 J	0.554 J	1.47 J
1,2,3,7,8-PeCDD	NV	0.526 J	4.39 J	1.09 J	6.93 J	6.76 J	1.41 UJK	0.598 J	0.955 J	1.54 J
1,2,3,7,8-PeCDF	NV	0.275 J	1.77 J	0.600 J	3.71 J	3.32 J	0.478 J	0.245 J	0.519 J	0.640 UJK
2,3,4,6,7,8-HxCDF	NV	0.432 J	4.52 J	1.95 J	6.85 J	9.93 J	0.866 J	0.980 UJK	1.10 UJK	3.61 J
2,3,4,7,8-PeCDF	NV	0.192 J	2.54 J	0.38 U	9.20 J	9.54 J	0.703 J	0.421 UJK	0.809 UJK	1.36 J
2,3,7,8-TCDD	NV	0.0849 UJ	0.880 J	0.220 U	0.760 J	1.83 J	0.179 UJK	0.0928 UJ	0.133 UJK	0.109 UJ
2,3,7,8-TCDF	NV	0.0843 UJ	0.600 J	0.220 U	1.20 J	1.25 J	0.141 UJ	0.0909 UJ	0.121 UJ	0.182 UJK
OCDD	NV	609 J	6,590	2,310	21,300 J	25,800 J	2,180 J	971 J	1,400 J	5,510 J
OCDF	NV	32.0 J	452	134 J	1,050 J	1,310 J	107 J	47.5 J	78.7 J	323 J
Total HpCDDs	NV	167 J	1,480	533	4,390 J	5,110 J	489 J	237 J	372 J	1,280 J
Total HpCDFs	NV	45.7 JK	448	171	1,470 J	1,530 J	137 J	63.9 J	104 J	391 J
Total HxCDDs	NV	15.7 J	173	60.5	418 J	590 J	44.9 J	23.1 JK	36.2 JK	93.6 J
Total HxCDFs	NV	24.0 JK	189	72.8	583 JK	706 JK	59.3 JK	32.3 JK	49.0 JK	141 J
Total PeCDDs	NV	0.800 J	21.1	1.09 J	26.8 J	30.2 JK	2.58 UJK	0.598 J	2.33 JK	4.53 JK
Total PeCDFs	NV	6.33 JK	95.2	14.3	129 JK	198 JK	11.8 JK	8.10 JK	13.3 JK	27.6 JK
Total TCDDs	NV	0.292 UJK	2.59	0.220 U	2.47 JK	4.83 JK	0.179 UJK	0.0928 UJ	0.292 UJK	0.109 UJ
Total TCDFs	NV	1.47 UJK	13.9	0.220 U	26.3 JK	31.6 JK	1.02 UJK	0.379 UJK	2.14 UJK	1.51 UJK
Dioxin and Furan TEQ[b][2]	11.8[c][3]	2.90 J	28.6 J	9.8 J	71.7 J	80.2 J	7.60 J	3.96 J	6.30 J	18.4 J

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Table 3
Summary of Soil Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Decision Unit:	Screening Criteria	DU-02 (cont.)		DU-03						
Sample Name:		HA-27-COMP-1-2	HA-27-COMP-2-3	DU03A-S-0.5	DU03B-S-0.5	DU03C-S-0.5	HA21-S-2.0	HA21-S-3.0	HA-28-Comp-2-3	HA-29-Comp-2-3
Sample Date:		05/11/2023	05/11/2023	10/05/2022	10/05/2022	10/05/2022	10/05/2022	10/05/2022	05/11/2023	05/11/2023
Sample Depth (ft bgs):		1.0-2.0	2.0-3.0	0-0.5	0-0.5	0-0.5	1.0-2.0	2.0-3.0	2.0-3.0	2.0-3.0
Total Metals (mg/kg)										
Arsenic	8.8[a][1]	--	--	38.2	38.4	40.3	9.60	13.2	16.4	9.96
Dioxins and Furans (pg/g)										
1,2,3,4,6,7,8-HpCDD	NV	1,300 J	349 J	15,300	14,600	14,600	1,190	3,300	2,300 J	1,230 J
1,2,3,4,6,7,8-HpCDF	NV	170 J	48.3 J	2,380	2,390	2,450	183	517	383 J	187 J
1,2,3,4,7,8,9-HpCDF	NV	11.9 J	3.36 J	238	227	230	16.7	30.0	25.7 J	15.3 J
1,2,3,4,7,8-HxCDD	NV	5.68 J	2.17 UJK	119	104	115	5.42	13.7	12.8 J	6.39 J
1,2,3,4,7,8-HxCDF	NV	6.89 J	2.08 J	146	116	125	6.39	14.5	13.7 J	7.91 J
1,2,3,6,7,8-HxCDD	NV	35.7 J	11.5 J	653	574	597	35.0	97.6	69.0 J	39.1 J
1,2,3,6,7,8-HxCDF	NV	5.14 J	2.03 J	100	89.6	95.7	5.72	12.1	12.8 J	7.23 J
1,2,3,7,8,9-HxCDD	NV	14.0 J	5.11 J	238	216	230	14.9	34.0	27.9 J	11.5 J
1,2,3,7,8,9-HxCDF	NV	1.24 J	0.500 UJK	5.24	5.04	5.06	0.360 J	3.20 J	2.01 J	4.00 UJ
1,2,3,7,8-PeCDD	NV	1.92 UJK	0.902 UJK	32.2	30.1	29.8	1.49 J	3.80 J	3.82 J	2.28 J
1,2,3,7,8-PeCDF	NV	1.35 J	0.456 UJK	24.1	19.7	21.6	0.890 J	2.20 J	1.93 J	0.883 J
2,3,4,6,7,8-HxCDF	NV	3.59 UJK	1.11 UJK	49.2	48.0	47.1	3.24 J	15.6	8.37 J	12.4 J
2,3,4,7,8-PeCDF	NV	2.13 UJK	0.876 J	20.6	16.9	20.1	0.840 J	3.94 J	3.57 J	1.49 J
2,3,7,8-TCDD	NV	0.118 UJ	0.109 UJ	1.70 J	1.20 J	1.80 U	0.220 U	0.0846 U	0.160 UJK	0.101 UJ
2,3,7,8-TCDF	NV	0.351 J	0.103 UJ	5.00	3.80	3.90	0.250 U	0.471 J	0.349 UJK	0.187 J
OCDD	NV	10,900 J	2,700 J	134,000	105,000	118,000	10,000	33,800	19,900 J	10,900 J
OCDF	NV	522 J	125 J	9,390	9,980	7,750	598	1,530	996 J	535 J
Total HpCDDs	NV	2,050 J	560 J	23,600	22,700	22,900	1,880	5,100	3,680 J	1,990 J
Total HpCDFs	NV	610 J	148 J	7,920	7,680	7,640	600	1,730	1,260 J	652 J
Total HxCDDs	NV	137 J	44.1 JK	2,210	2,020	2,100	120	332 JK	259 J	160 J
Total HxCDFs	NV	208 JK	65.9 JK	2,940	2,600	2,740	161	520	408 J	240 J
Total PeCDDs	NV	7.99 UJK	2.08 UJK	125	118	127	1.90 J	12.2 JK	11.5 JK	5.21 JK
Total PeCDFs	NV	44.4 JK	15.4 JK	677	563	644	21.2	68.9	64.6 J	33.7 JK
Total TCDDs	NV	0.602 UJK	0.109 UJ	13.1 J	13.2 J	8.78 J	0.220 U	0.164	0.160 UJK	0.101 UJ
Total TCDFs	NV	3.22 JK	1.70 UJK	41.1	36.9	39.5	0.250 U	3.54 JK	3.87 UJK	1.29 JK
Dioxin and Furan TEQ[b][2]	11.8[c][3]	26.7 J	7.90 J	395 J	359 J	370	26.1 J	73.3 J	53.1 J	29.2 J

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Table 3
Summary of Soil Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Decision Unit:	Screening Criteria	DU-05					
Sample Name:		DU05-S-0.5	HA16-S-2.0	HA16-S-3.0	HA17-S-2.0	HA18-S-2.0	HA18-S-3.0
Sample Date:		10/05/2022	10/05/2022	10/05/2022	10/05/2022	10/05/2022	10/05/2022
Sample Depth (ft bgs):		0-0.5	1.0-2.0	2.0-3.0	1.0-2.0	1.0-2.0	2.0-3.0
Total Metals (mg/kg)							
Arsenic	8.8[(a)(1)]	13.3	41.8	10.2	6.08	53.2	32.2
Dioxins and Furans (pg/g)							
1,2,3,4,6,7,8-HpCDD	NV	2,110	2,550	765	248	20,400	3,720
1,2,3,4,6,7,8-HpCDF	NV	377	435	108	39.2	3,620	590
1,2,3,4,7,8,9-HpCDF	NV	27.8	46.1	6.30	3.96 J	374	36.0
1,2,3,4,7,8-HxCDD	NV	23.7	18.9	4.71	1.41 J	153	19.6
1,2,3,4,7,8-HxCDF	NV	23.5	22.9	3.83	2.66 J	179	22.2
1,2,3,6,7,8-HxCDD	NV	116	134	26.4	10.5	734	121
1,2,3,6,7,8-HxCDF	NV	18.7	24.6	3.47	1.98 J	136	17.6
1,2,3,7,8,9-HxCDD	NV	57.4	61.3	12.0	5.69	288	44.9
1,2,3,7,8,9-HxCDF	NV	1.04 J	0.640 U	0.964 J	0.220 U	9.36	2.55 J
1,2,3,7,8-PeCDD	NV	9.17	9.10	1.65 J	0.870 U	36.5	6.71
1,2,3,7,8-PeCDF	NV	5.71	5.87	0.933 J	0.470 U	27.1	3.80 J
2,3,4,6,7,8-HxCDF	NV	11.1	16.7	4.02	1.55 J	65.8	25.0
2,3,4,7,8-PeCDF	NV	5.65	4.63 J	1.60 J	0.650 J	24.7	7.87
2,3,7,8-TCDD	NV	1.46 J	0.240 U	0.0426 U	0.220 U	1.33 J	0.285 UJK
2,3,7,8-TCDF	NV	1.50	1.31 J	0.132 UJK	0.230 U	3.81	0.653 J
OCDD	NV	16,600	15,300	5,760	1,710	180,000 J-	42,400
OCDF	NV	985	1,290	322	98.2	16,300 J-	1,500
Total HpCDDs	NV	3,460	4,040	1,190	389	31,000	5,800
Total HpCDFs	NV	1,070	1,550	382	126	12,600	1,930
Total HxCDDs	NV	482	463	97.9	42.5	2,460	439
Total HxCDFs	NV	478	599	135 JK	45.8	4,350	763 JK
Total PeCDDs	NV	46.6	21.9	4.14 JK	1.20 J	102	21.7 JK
Total PeCDFs	NV	151	147	24.6	4.01 J	674	118 JK
Total TCDDs	NV	9.59	0.320 U	0.0426 U	0.220 U	5.43	0.494 UJK
Total TCDFs	NV	23.4	7.96	1.40 UJK	0.230 U	25.0	6.20 JK
Dioxin and Furan TEQ[(b)(2)]	11.8[(c)(3)]	68.2 J	74.1 J	18.3 J	6.60 J	506 J	91.3 J

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Table 3
Summary of Soil Analytical Results
Yard Investigation
Permapost Products, Inc., Hillsboro, Oregon

Notes

Shading indicates values that exceed screening criteria; non-detect results (U, UJ, UJK) were not compared with screening criteria.

-- = not analyzed.

ft bgs = feet below ground surface.

J = result is estimated.

J- = result is estimated, but the result may be biased low.

JK = result is estimated and an estimated maximum potential concentration.

mg/kg = milligrams per kilogram.

NV = no value.

pg/g = picograms per gram.

TEQ = toxicity equivalency.

U = result is non-detect at the estimated detection limit, method detection limit, or method reporting limit.

UJ = result is non-detect with an estimated detection limit.

UJK = result is non-detect, an estimated value, and an estimated maximum potential concentration.

[a]Oregon background concentration, Portland Basin.

[b]Dioxin and furan TEQs are calculated as the sum of each detected congener concentration multiplied by the corresponding TEF value. Non-detect congeners are also multiplied by one-half.

[c]Preliminary remediation goal

References

[1]DEQ. 2013. *Development of Oregon Background Metals Concentrations in Soil* . Oregon Department of Environmental Quality, Land Quality Division Cleanup Program, Portland, Oregon. March.

[2]Van den Berg et al. 2006. "The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds." *Toxicological Sciences.* 93(2): 223–241.

[3]DEQ. 2018. Table: *Risk-Based Concentrations for Individual Chemicals.* Oregon Department of Environmental Quality. May.

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FIGURE

Figure
Conceptual Remediation Areas

Permapost Products, Inc.
Hillsboro, OR

Property 3
1S209BD00600

Property 2
1S209BD00700

Property 1
1S209BD00800

SE 39th Rd

SE Witch Hazel Rd

SE 41st Ct

SE 41st Ave

Legend

Remediation Area

- Remediate to 1 foot bgs
- Remediate to 3 feet bgs
- Existing Berm
- Former Retail Yard Driving Lane
- Building
- Hardscape / Pavement
- AOI-5 Tax Lot
- Permapost Property
- Tax Lot

Notes
AOI = area of interest.
bgs = below ground surface.
Permapost = Permapost Products, Inc.

0 30
Feet

Data Sources
Aerial photograph obtained from the City of Portland (2022); tax lot data obtained from Oregon Metro (2023).

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Path: X:\8012.01\Projects\Permapost_YardSampling\WP\Pro\M8012_01_001_Remediation_Areas.aprx\Fig Conceptual Remediation Areas
Print Date: 2/26/2024
Reviewed By: cwise
Produced By: jroberts
Project: M8012.01.001

ATTACHMENT A

PROUCL OUTPUT

Normal Background Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.12/7/2024 12:50:10 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
New or Future K Observations	1

C0

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Minimum	0.812	First Quartile	4.245
Second Largest	7.31	Median	5.625
Maximum	11.8	Third Quartile	6.883
Mean	5.569	SD	3.441
Coefficient of Variation	0.618	Skewness	0.338
Mean of logged Data	1.455	SD of logged Data	0.895

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.187	d2max (for USL)	2.032

Normal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 95% Coverage	16.54	90% Percentile (z)	9.979
95% UPL (t)	12.48	95% Percentile (z)	11.23
95% USL	12.56	99% Percentile (z)	13.57

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.