

Technical Memorandum

TO: Matthew Morris, PE, Washington State Department of Ecology
CC: Amy Sikora, Washington State Department of Natural Resources
FROM: Sierra Mott and Eric Weber, LHG, CWRE
DATE: October 16, 2019
RE: **Third Quarter 2019 Groundwater Monitoring Results
Webster Nursery Site, Site ID 3380
Tumwater, Washington
Project No. 0774006.040.045**

Introduction

This technical memorandum summarizes the results of quarterly groundwater monitoring completed by Landau Associates, Inc. (LAI) at the Washington State Department of Natural Resources (DNR) Webster Nursery site, a former pesticide-storage warehouse in Tumwater, Washington (site; Figure 1). The site is associated with past releases of organochlorine pesticides to soil and groundwater. Constituents of concern include the organochlorine pesticides heptachlor epoxide (HE; breakdown product of heptachlor) and technical chlordane.

Remedial action excavation and disposal of HE-contaminated soil were completed in August 2018. A summary of the remedial action is provided in a draft Cleanup Action Completion Report (LAI 2018).

Groundwater Monitoring Summary

Third quarter 2019 (3Q19) groundwater monitoring was completed on August 28, 2019. Groundwater monitoring was completed in accordance with the framework established by Washington State Department of Ecology (Ecology) Agreed Order No. DE 00TCP-SR295, the Remedial Action Work Plan (LAI 2017), and the Compliance Monitoring Plan (LAI 2019). Groundwater samples were collected from two wells (SW-10R and SW-11R). Analytical Resources, Inc. of Tukwila, Washington analyzed groundwater samples for organochlorine pesticides using U.S. Environmental Protection Agency Method 8081A low-level.

Groundwater samples were collected with a peristaltic pump and dedicated tubing using low-flow groundwater sampling techniques. Low-flow groundwater monitoring consists of measuring the depth-to-water with an electronic groundwater level indicator, monitoring field parameters with a YSI 554 multi-parameter probe, and measuring turbidity with a handheld meter. One duplicate sample (SW-99 at SW-11R) was collected for quality control purposes.

Groundwater Monitoring Results

Groundwater monitoring results are summarized below:

- No analytes other than HE were detected in either well during 3Q19 groundwater monitoring.

- HE was detected in SW-10R at a concentration of 0.0875 micrograms per liter ($\mu\text{g/L}$). This concentration exceeds the cleanup level (CUL; 0.0048 $\mu\text{g/L}$).
- HE was detected in SW-11R at a concentration of 0.0057 $\mu\text{g/L}$. This concentration narrowly exceeds the CUL.

August 2019 organochlorine pesticide data are provided in Table 1, and the laboratory data package is provided in Attachment 1. Time series data of recent HE concentrations in groundwater at SW-10R and SW-11R (dating back to January 2010) are presented on Figure 3.

Groundwater elevations at SW-10R and SW-11R were 180.75 and 180.41 feet mean sea level, respectively. Depth-to-water and groundwater elevation data are provided in Table 2 and SW-10R groundwater elevation data collected since the remedial action is shown on Figure 3.

Environmental Information Management Submittal

An Environmental Information Management submittal is required. The submittal will be completed in fall 2019, after this technical memorandum has been submitted to Ecology.

LANDAU ASSOCIATES, INC.



Sierra Mott
Senior Project Scientist



Eric Weber, LHG, CWRE
Principal

SMM/EFW/kjg

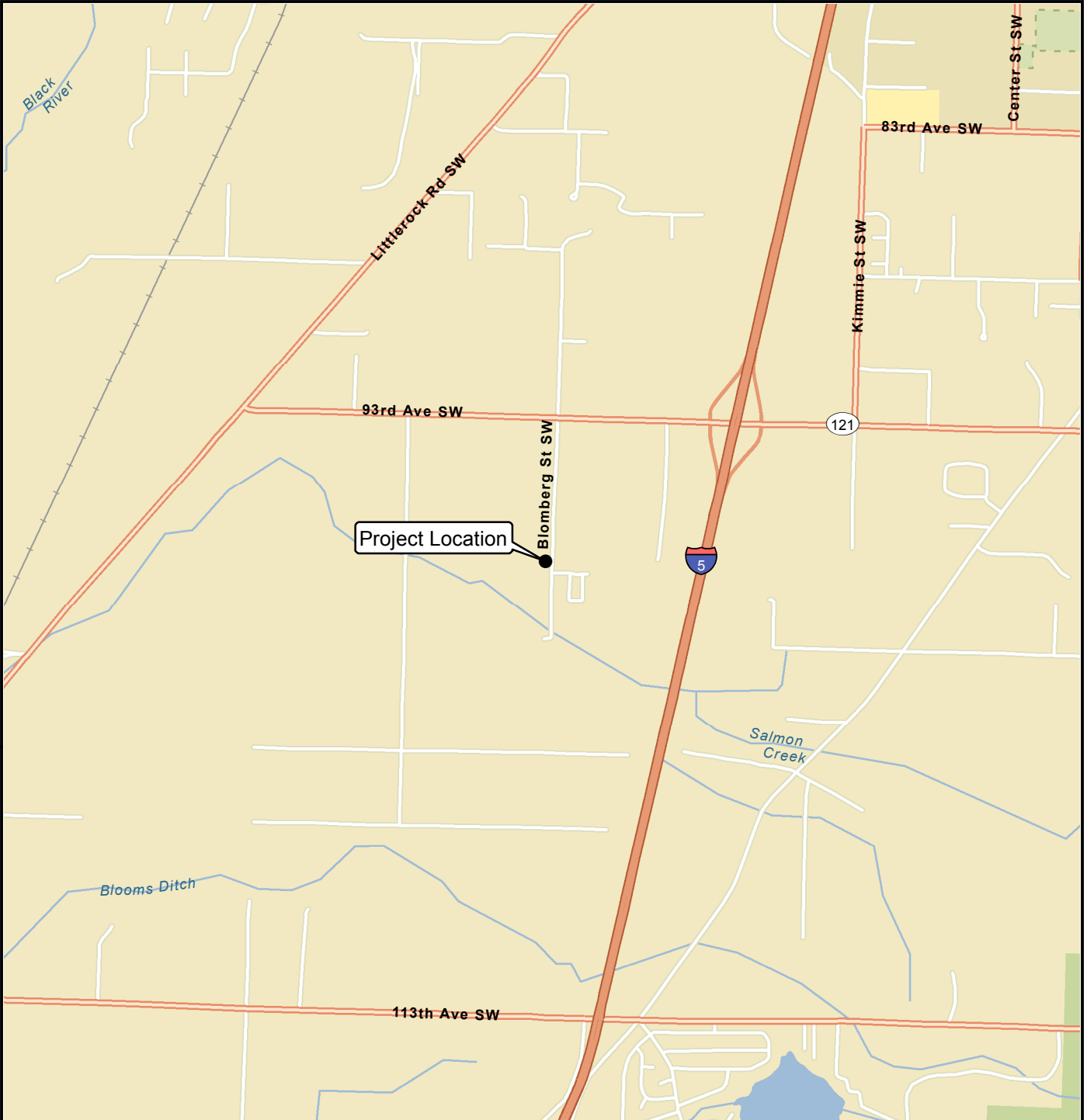
[Y:\774\006\R\QUARTERLY GW MONITORING REPORTS\3Q19\WEBSTER NURSERY 3Q19 GW MONITORING TECHNICAL MEMORANDUM.DOCX]

Attachments: Figure 1. Vicinity Map
Figure 2. Monitoring Well Network
Figure 3. Heptachlor Epoxide and GWE Time Series, SW-10(R) and SW-11(R)
Table 1. Groundwater Analytical Results
Table 2. Groundwater Level Measurements
Attachment 1. August 2019 Laboratory Data Package

References

- LAI. 2019. Compliance Monitoring Plan, Washington State Department of Natural Resources Webster Nursery, Tumwater, Washington. Landau Associates, Inc. July 24.
- LAI. 2018. Draft Cleanup Action Completion Report, Washington State Department of Natural Resources Webster Nursery, Tumwater, Washington. Landau Associates, Inc. October 12.
- LAI. 2017. Remedial Action Work Plan, Webster Nursery, 9805 Blomberg Street SW, Tumwater, Washington. Landau Associates, Inc. October 31.

G:\Projects\774\006\020\026\FIS\F01_VicinityMap.mxd 5/16/2016 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Data Source: Esri 2012

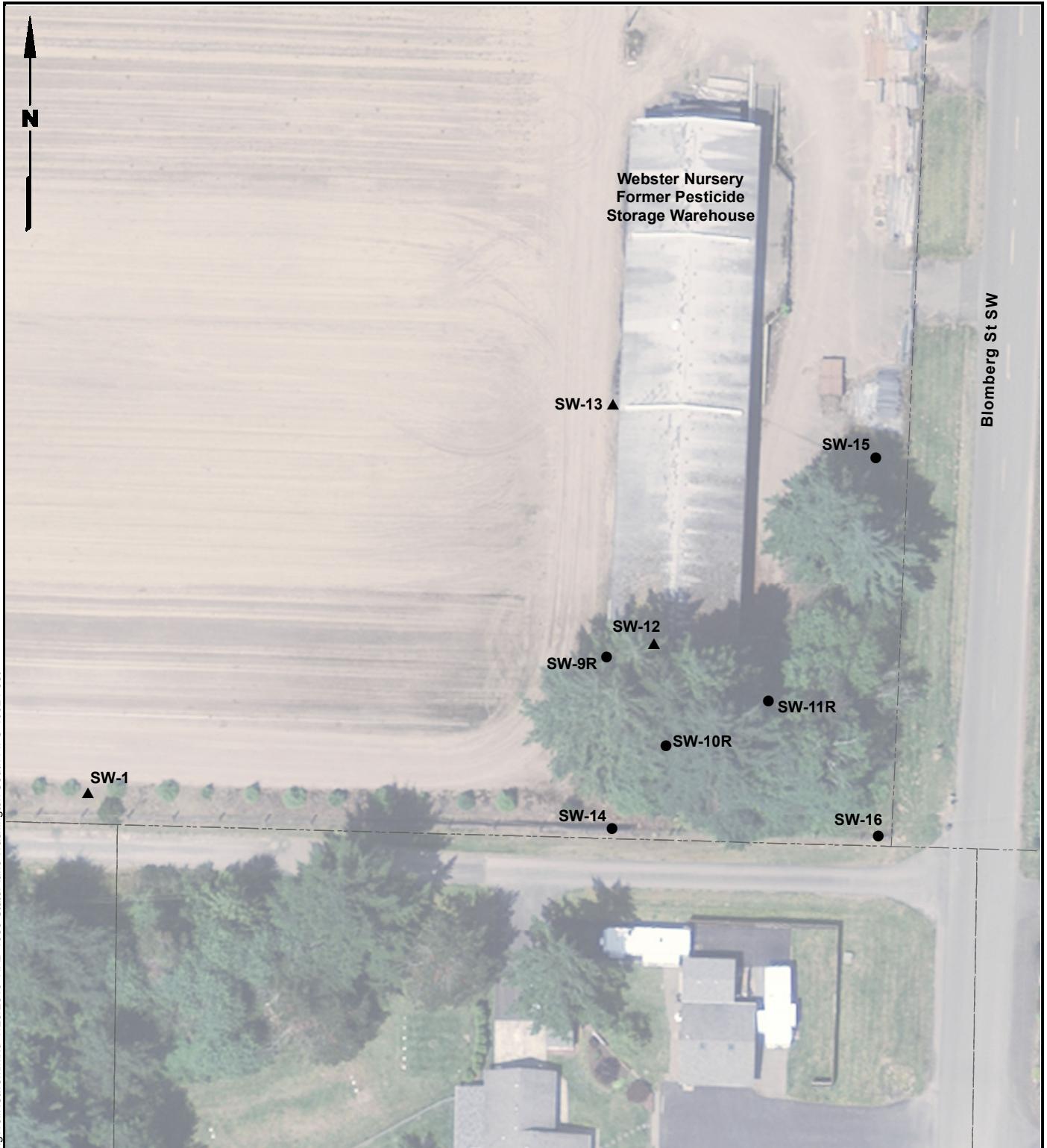


Webster Nursery Site
Tumwater, Washington

Vicinity Map

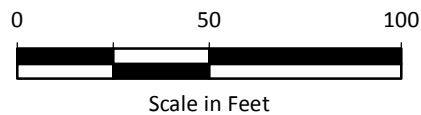
Figure
1

G:\Projects\7741006\040\045\F02MonitoringWellNetwork.mxd 7/23/2019 NAD_1983_StatePlane_Washington_South_FIPS_4602_Feet



Legend

- Pesticide Monitoring Well
- ▲ Other Monitoring Well
- Tax Parcels



Notes

1. SW-9R, SW-10R, and SW-11R are new (replacement) wells.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

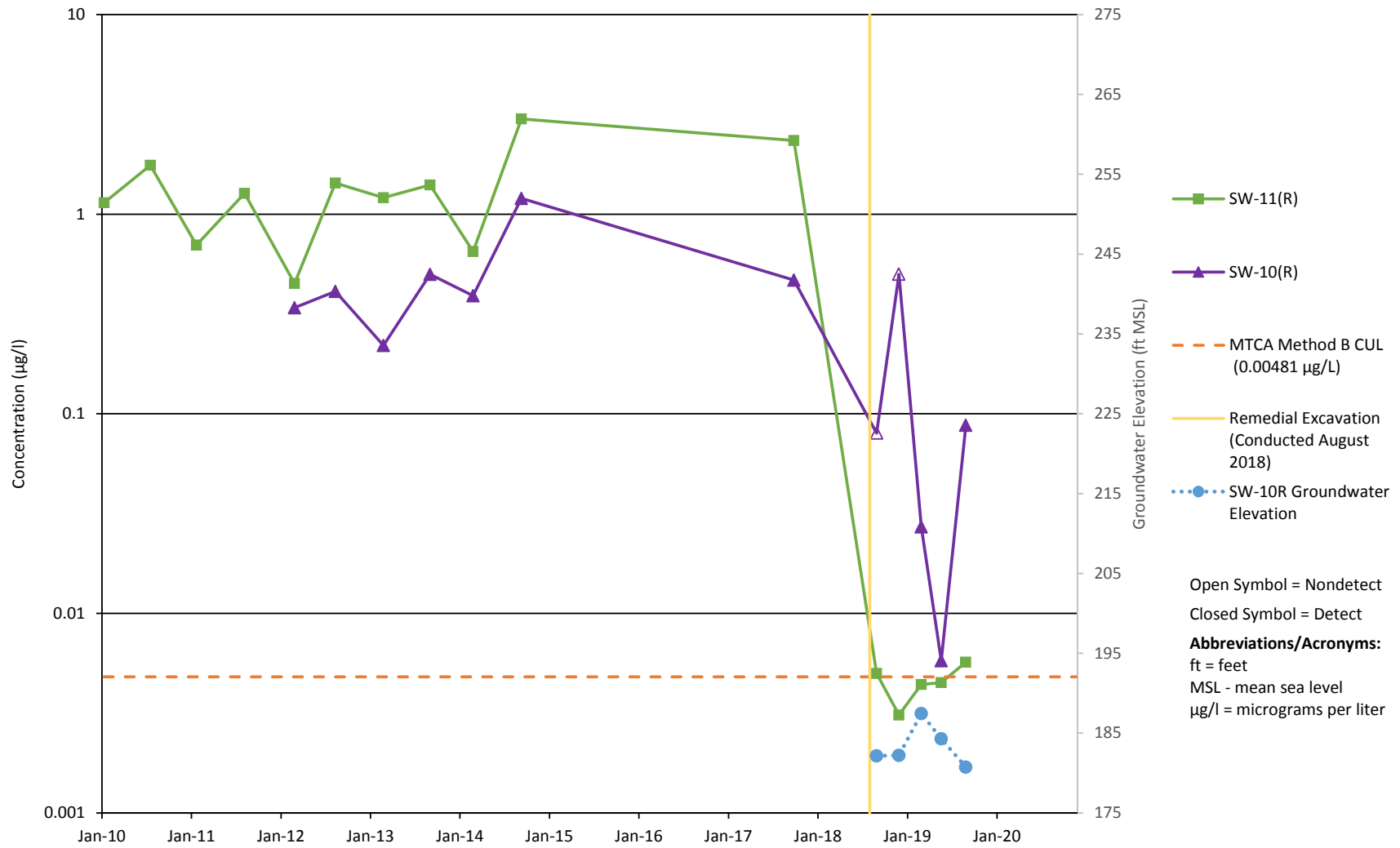
Data Sources: Thurston County GIS; WA DNR Survey, 2018.



Webster Nursery Site
Tumwater, Washington

Monitoring Well Network

Figure
2



■ SW-11(R)
▲ SW-10(R)
- - - MTCA Method B CUL (0.00481 µg/L)
| Remedial Excavation (Conducted August 2018)
● SW-10R Groundwater Elevation

 Open Symbol = Nondetect
 Closed Symbol = Detect
Abbreviations/Acronyms:
 ft = feet
 MSL = mean sea level
 µg/l = micrograms per liter



Webster Nursery Site
Tumwater, Washington

**Heptachlor Epoxide and Groundwater
Elevation Time Series
SW-10(R) and SW-11(R)**

Figure
3

Table 1
Groundwater Analytical Results
Webster Nursery
Tumwater, Washington

Analyte	MTCA Method B Cleanup Levels	Sample Location, Sample ID, Laboratory SDG Sample Date, and Sample Type		
		SW-10R	SW-11R	SW-11R
		SW-10R-20190828 19H0425 8/28/2019 N	SW-11R-20190828 19H0425 8/28/2019 N	SW-99-20190828 19H0425 8/28/2019 FD
Pesticides (µg/L; SW-846 8081B)				
4,4'-DDD	--	0.0013 U	0.0013 U	0.0013 U
4,4'-DDE	--	0.0013 U	0.0013 U	0.0013 U
4,4'-DDT	--	0.0013 U	0.0013 U	0.0013 U
Aldrin	--	0.0006 U	0.0006 U	0.0006 U
alpha-BHC	--	0.0006 U	0.0006 U	0.0006 U
beta-BHC	--	0.0006 U	0.0006 U	0.0006 U
Chlordane	0.25	0.0050 U	0.0050 U	0.0050 U
cis-Chlordane	--	0.0006 U	0.0006 U	0.0006 U
delta-BHC	--	0.0006 U	0.0006 U	0.0006 U
Dieldrin	--	0.0013 U	0.0013 U	0.0013 U
Endosulfan I	--	0.0006 U	0.0006 U	0.0006 U
Endosulfan II	--	0.0013 U	0.0013 U	0.0013 U
Endosulfan Sulfate	--	0.0013 U	0.0013 U	0.0013 U
Endrin	--	0.0013 U	0.0013 U	0.0013 U
Endrin Aldehyde	--	0.0013 U	0.0013 U	0.0013 U
Endrin Ketone	--	0.0013 U	0.0013 U	0.0013 U
gamma-BHC	--	0.0006 U	0.0006 U	0.0006 U
Heptachlor	0.0194	0.0006 U	0.0006 U	0.0006 U
Heptachlor Epoxide	0.00481	0.0875	0.0057	0.0065
Methoxychlor	--	0.0063 U	0.0063 U	0.0063 U
Toxaphene	--	0.0625 U	0.0625 U	0.0625 U
trans-Chlordane	--	0.0006 U	0.0006 U	0.0006 U

Notes:

-- = cleanup level not applicable

Bold text = Indicates detected analyte.

Green Box = Detected concentration is greater than the cleanup level

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

FD = field duplicate

ID = identification

µg/L = micrograms per liter

MTCA = Model Toxics Control Act

N = primary sample

SDG = sample delivery group

Table 2
Groundwater Level Measurements
Webster Nursery
Tumwater, Washington

Well ID	Top of Casing Elevation (ft)	Depth to Water (ft bgs)	Groundwater Elevation (ft)
SW-10R	193.41	12.66	180.75
SW-11R	192.50	12.09	180.41

Groundwater elevation data was collected August 28, 2019

Abbreviations:

bgs = below ground surface

ft = feet

ID = identification

August 2019 Laboratory Data Package



21 September 2019

Evelyn Ives
Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma, WA 98402

RE: Webster Nursery

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
19H0425	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)
 www.arilabs.com

ARI Assigned Number: 19H0425	Turn-around Requested: Standard	Page: 1 of 1
ARI Client Company: Landau Associates	Phone: 253-926-2493	Date: 8/28/2019
Client Contact: Eric Weber, Sierra Mott		Ice Present? Yes
Client Project Name: Webster Nursery: quarterly groundwater sampling		No. of Coolers: 1
Client Project #: 774006.040.045	Samplers: Katie Gauglitz	Cooler Temps: 5.1°C

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested								Notes/Comments	
					Pesticides	GPAs	8081B	LL	Organochlorine					
SW-10R-20190828	8/28/19	1012	Aq	2	X									
SW-11R-20190828	8/28/19	1122	Aq	2	X									
SW-99-20190828	8/28/19	1125	Aq	2	X									
Comments/Special Instructions	Relinquished by: (Signature) <i>Katie Gauglitz</i>	Received by: (Signature) <i>Jacob Walte</i>		Relinquished by: (Signature)	Received by: (Signature)									
	Printed Name: Katie Gauglitz	Printed Name: Jacob Walte		Printed Name:	Printed Name:									
	Company: Landau Associates	Company: AIZ		Company:	Company:									
	Date & Time: 8/28/2019 13:15	Date & Time: 8/28/19 1315		Date & Time:	Date & Time:									

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SW-10R-20190828	19H0425-01	Water	28-Aug-2019 10:12	28-Aug-2019 13:15
SW-11R-20190828	19H0425-02	Water	28-Aug-2019 11:22	28-Aug-2019 13:15
SW-99-20190828	19H0425-03	Water	28-Aug-2019 11:25	28-Aug-2019 13:15



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2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

Work Order Case Narrative

Pesticides - EPA Method SW8081B

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits with the exception of the internal standard BNB which is out of control high on one column. The data was reported from the column in control for all associated samples.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The LCS percent recoveries were within control limits.



Cooler Receipt Form

ARI Client: Landa

Project Name: webster Nursey

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 19H0425

Tracking No: _____ (NA)

Preliminary Examination Phase:

- Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO
- Were custody papers included with the cooler? YES NO
- Were custody papers properly filled out (ink, signed, etc.) YES NO
- Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1315

5.17

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO 5206

Cooler Accepted by: JAS Date: 08/28/19 Time: 1315

Complete custody forms and attach all shipping documents

Log-In Phase:

- Was a temperature blank included in the cooler? JAS YES NO
- What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____
- Was sufficient ice used (if appropriate)? NA YES NO
- How were bottles sealed in plastic bags? Individually Grouped Not
- Did all bottles arrive in good condition (unbroken)? YES NO
- Were all bottle labels complete and legible? YES NO
- Did the number of containers listed on COC match with the number of containers received? YES NO
- Did all bottle labels and tags agree with custody papers? YES NO
- Were all bottles used correct for the requested analyses? YES NO
- Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO
- Were all VOC vials free of air bubbles? NA YES NO
- Was sufficient amount of sample sent in each bottle? YES NO
- Date VOC Trip Blank was made at ARI NA
- Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: [Signature] Date: 8/28/19 Time: 1336 Labels checked by: [Signature]

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: _____ Date: _____



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

SW-10R-20190828
19H0425-01 (Water)

Chlorinated Pesticides

Method: EPA 8081B Sampled: 08/28/2019 10:12
Instrument: ECD6 Analyst: YZ Analyzed: 09/09/2019 16:10

Sample Preparation: Preparation Method: EPA 3510C SepF Extract ID: 19H0425-01 A 01
Preparation Batch: BHI0004 Sample Size: 1000 mL
Prepared: 03-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 19H0425-01 A 01
Cleanup Batch: CHI0019 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 19H0425-01 A 01
Cleanup Batch: CHI0018 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
alpha-BHC	319-84-6	1	0.0006	ND	ug/L	U
beta-BHC	319-85-7	1	0.0006	ND	ug/L	U
gamma-BHC (Lindane)	58-89-9	1	0.0006	ND	ug/L	U
delta-BHC	319-86-8	1	0.0006	ND	ug/L	U
Heptachlor	76-44-8	1	0.0006	ND	ug/L	U
Aldrin	309-00-2	1	0.0006	ND	ug/L	U
Heptachlor Epoxide	1024-57-3	1	0.0006	0.0780	ug/L	E
trans-Chlordane (beta-Chlordane)	5103-74-2	1	0.0006	ND	ug/L	U
cis-Chlordane (alpha-chlordane)	5103-71-9	1	0.0006	ND	ug/L	U
Endosulfan I	959-98-8	1	0.0006	ND	ug/L	U
4,4'-DDE	72-55-9	1	0.0013	ND	ug/L	U
Dieldrin	60-57-1	1	0.0013	ND	ug/L	U
Endrin	72-20-8	1	0.0013	ND	ug/L	U
Endosulfan II	33213-65-9	1	0.0013	ND	ug/L	U
4,4'-DDD	72-54-8	1	0.0013	ND	ug/L	U
Endrin Aldehyde	7421-93-4	1	0.0013	ND	ug/L	U
4,4'-DDT	50-29-3	1	0.0013	ND	ug/L	U
Endosulfan Sulfate	1031-07-8	1	0.0013	ND	ug/L	U
Endrin Ketone	53494-70-5	1	0.0013	ND	ug/L	U
Methoxychlor	72-43-5	1	0.0063	ND	ug/L	U
Toxaphene	8001-35-2	1	0.0625	ND	ug/L	U
Chlordane (NOS)	57-74-9	1	0.0050	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				30-160 %	80.2	%
<i>Surrogate: Decachlorobiphenyl [2C]</i>				30-160 %	85.4	%
<i>Surrogate: Tetrachlorometaxylene</i>				30-160 %	55.7	%
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				30-160 %	NRS	NRS



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

SW-10R-20190828
19H0425-01RE1 (Water)

Chlorinated Pesticides

Method: EPA 8081B Sampled: 08/28/2019 10:12
Instrument: ECD6 Analyst: YZ Analyzed: 09/10/2019 16:34

Sample Preparation: Preparation Method: EPA 3510C SepF Extract ID: 19H0425-01RE1 A 01
Preparation Batch: BHI0004 Sample Size: 1000 mL
Prepared: 03-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 19H0425-01RE1 A 01
Cleanup Batch: CHI0019 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 19H0425-01RE1 A 01
Cleanup Batch: CHI0018 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
alpha-BHC	319-84-6	3	0.0019	ND	ug/L	U
beta-BHC	319-85-7	3	0.0019	ND	ug/L	U
gamma-BHC (Lindane)	58-89-9	3	0.0019	ND	ug/L	U
delta-BHC	319-86-8	3	0.0019	ND	ug/L	U
Heptachlor	76-44-8	3	0.0019	ND	ug/L	U
Aldrin	309-00-2	3	0.0019	ND	ug/L	U
Heptachlor Epoxide	1024-57-3	3	0.0019	0.0875	ug/L	D
trans-Chlordane (beta-Chlordane)	5103-74-2	3	0.0019	ND	ug/L	U
cis-Chlordane (alpha-chlordane)	5103-71-9	3	0.0019	ND	ug/L	U
Endosulfan I	959-98-8	3	0.0019	ND	ug/L	U
4,4'-DDE	72-55-9	3	0.0038	ND	ug/L	U
Dieldrin	60-57-1	3	0.0038	ND	ug/L	U
Endrin	72-20-8	3	0.0038	ND	ug/L	U
Endosulfan II	33213-65-9	3	0.0038	ND	ug/L	U
4,4'-DDD	72-54-8	3	0.0038	ND	ug/L	U
Endrin Aldehyde	7421-93-4	3	0.0038	ND	ug/L	U
4,4'-DDT	50-29-3	3	0.0038	ND	ug/L	U
Endosulfan Sulfate	1031-07-8	3	0.0038	ND	ug/L	U
Endrin Ketone	53494-70-5	3	0.0038	ND	ug/L	U
Methoxychlor	72-43-5	3	0.0188	ND	ug/L	U
Toxaphene	8001-35-2	3	0.188	ND	ug/L	U
Chlordane (NOS)	57-74-9	3	0.0150	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>				30-160 %	86.3	%
<i>Surrogate: Decachlorobiphenyl [2C]</i>				30-160 %	89.8	%
<i>Surrogate: Tetrachlorometaxylene</i>				30-160 %	67.7	%
<i>Surrogate: Tetrachlorometaxylene [2C]</i>				30-160 %	NRS	NRS



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

SW-11R-20190828
19H0425-02 (Water)

Chlorinated Pesticides

Method: EPA 8081B Sampled: 08/28/2019 11:22
Instrument: ECD6 Analyst: YZ Analyzed: 09/09/2019 16:28

Sample Preparation: Preparation Method: EPA 3510C SepF Extract ID: 19H0425-02 A 01
Preparation Batch: BHI0004 Sample Size: 1000 mL
Prepared: 03-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 19H0425-02 A 01
Cleanup Batch: CHI0019 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 19H0425-02 A 01
Cleanup Batch: CHI0018 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
alpha-BHC	319-84-6	1	0.0006	ND	ug/L	U
beta-BHC	319-85-7	1	0.0006	ND	ug/L	U
gamma-BHC (Lindane)	58-89-9	1	0.0006	ND	ug/L	U
delta-BHC	319-86-8	1	0.0006	ND	ug/L	U
Heptachlor	76-44-8	1	0.0006	ND	ug/L	U
Aldrin	309-00-2	1	0.0006	ND	ug/L	U
Heptachlor Epoxide	1024-57-3	1	0.0006	0.0057	ug/L	P1
trans-Chlordane (beta-Chlordane)	5103-74-2	1	0.0006	ND	ug/L	U
cis-Chlordane (alpha-chlordane)	5103-71-9	1	0.0006	ND	ug/L	U
Endosulfan I	959-98-8	1	0.0006	ND	ug/L	U
4,4'-DDE	72-55-9	1	0.0013	ND	ug/L	U
Dieldrin	60-57-1	1	0.0013	ND	ug/L	U
Endrin	72-20-8	1	0.0013	ND	ug/L	U
Endosulfan II	33213-65-9	1	0.0013	ND	ug/L	U
4,4'-DDD	72-54-8	1	0.0013	ND	ug/L	U
Endrin Aldehyde	7421-93-4	1	0.0013	ND	ug/L	U
4,4'-DDT	50-29-3	1	0.0013	ND	ug/L	U
Endosulfan Sulfate	1031-07-8	1	0.0013	ND	ug/L	U
Endrin Ketone	53494-70-5	1	0.0013	ND	ug/L	U
Methoxychlor	72-43-5	1	0.0063	ND	ug/L	U
Toxaphene	8001-35-2	1	0.0625	ND	ug/L	U
Chlordane (NOS)	57-74-9	1	0.0050	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>			30-160 %	77.1	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>			30-160 %	85.6	%	
<i>Surrogate: Tetrachlorometaxylene</i>			30-160 %	58.3	%	
<i>Surrogate: Tetrachlorometaxylene [2C]</i>			30-160 %		NRS	NRS



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

SW-99-20190828

19H0425-03 (Water)

Chlorinated Pesticides

Method: EPA 8081B Sampled: 08/28/2019 11:25
Instrument: ECD6 Analyst: YZ Analyzed: 09/09/2019 16:46

Sample Preparation: Preparation Method: EPA 3510C SepF Extract ID: 19H0425-03 A 01
Preparation Batch: BHI0004 Sample Size: 1000 mL
Prepared: 03-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 19H0425-03 A 01
Cleanup Batch: CHI0019 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 19H0425-03 A 01
Cleanup Batch: CHI0018 Initial Volume: 0.5 mL
Cleaned: 04-Sep-2019 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
alpha-BHC	319-84-6	1	0.0006	ND	ug/L	U
beta-BHC	319-85-7	1	0.0006	ND	ug/L	U
gamma-BHC (Lindane)	58-89-9	1	0.0006	ND	ug/L	U
delta-BHC	319-86-8	1	0.0006	ND	ug/L	U
Heptachlor	76-44-8	1	0.0006	ND	ug/L	U
Aldrin	309-00-2	1	0.0006	ND	ug/L	U
Heptachlor Epoxide	1024-57-3	1	0.0006	0.0065	ug/L	
trans-Chlordane (beta-Chlordane)	5103-74-2	1	0.0006	ND	ug/L	U
cis-Chlordane (alpha-chlordane)	5103-71-9	1	0.0006	ND	ug/L	U
Endosulfan I	959-98-8	1	0.0006	ND	ug/L	U
4,4'-DDE	72-55-9	1	0.0013	ND	ug/L	U
Dieldrin	60-57-1	1	0.0013	ND	ug/L	U
Endrin	72-20-8	1	0.0013	ND	ug/L	U
Endosulfan II	33213-65-9	1	0.0013	ND	ug/L	U
4,4'-DDD	72-54-8	1	0.0013	ND	ug/L	U
Endrin Aldehyde	7421-93-4	1	0.0013	ND	ug/L	U
4,4'-DDT	50-29-3	1	0.0013	ND	ug/L	U
Endosulfan Sulfate	1031-07-8	1	0.0013	ND	ug/L	U
Endrin Ketone	53494-70-5	1	0.0013	ND	ug/L	U
Methoxychlor	72-43-5	1	0.0063	ND	ug/L	U
Toxaphene	8001-35-2	1	0.0625	ND	ug/L	U
Chlordane (NOS)	57-74-9	1	0.0050	ND	ug/L	U
<i>Surrogate: Decachlorobiphenyl</i>			30-160 %	80.5	%	
<i>Surrogate: Decachlorobiphenyl [2C]</i>			30-160 %	88.6	%	
<i>Surrogate: Tetrachlorometaxylene</i>			30-160 %	58.3	%	P1
<i>Surrogate: Tetrachlorometaxylene [2C]</i>			30-160 %	31.5	%	P1



Landau Associates, Inc. - Tacoma
2107 South C Street
Tacoma WA, 98402

Project: Webster Nursery
Project Number: Webster Nursery
Project Manager: Evelyn Ives

Reported:
21-Sep-2019 11:38

Chlorinated Pesticides - Quality Control

Batch BHI0004 - EPA 3510C SepF

Instrument: ECD6 Analyst: YZ

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BHI0004-BLK1)										
					Prepared: 03-Sep-2019 Analyzed: 09-Sep-2019 14:58					
alpha-BHC	ND	0.0006	ug/L							U
beta-BHC	ND	0.0006	ug/L							U
gamma-BHC (Lindane)	ND	0.0006	ug/L							U
delta-BHC	ND	0.0006	ug/L							U
Heptachlor	ND	0.0006	ug/L							U
Aldrin	ND	0.0006	ug/L							U
Heptachlor Epoxide	ND	0.0006	ug/L							U
trans-Chlordane (beta-Chlordane)	ND	0.0006	ug/L							U
cis-Chlordane (alpha-chlordane)	ND	0.0006	ug/L							U
Endosulfan I	ND	0.0006	ug/L							U
4,4'-DDE	ND	0.0013	ug/L							U
Dieldrin	ND	0.0013	ug/L							U
Endrin	ND	0.0013	ug/L							U
Endosulfan II	ND	0.0013	ug/L							U
4,4'-DDD	ND	0.0013	ug/L							U
Endrin Aldehyde	ND	0.0013	ug/L							U
4,4'-DDT	ND	0.0013	ug/L							U
Endosulfan Sulfate	ND	0.0013	ug/L							U
Endrin Ketone	ND	0.0013	ug/L							U
Methoxychlor	ND	0.0063	ug/L							U
Toxaphene	ND	0.0625	ug/L							U
Chlordane (NOS)	0.0095	0.0050	ug/L							
Surrogate: Decachlorobiphenyl	0.0169		ug/L	0.0200		84.5	30-160			
Surrogate: Decachlorobiphenyl [2C]	0.0187		ug/L	0.0200		93.4	30-160			
Surrogate: Tetrachlorometaxylyene	0.0113		ug/L	0.0200		56.4	30-160			
Surrogate: Tetrachlorometaxylyene [2C]	0.0114		ug/L	0.0200		56.8	30-160			
LCS (BHI0004-BS1)										
					Prepared: 03-Sep-2019 Analyzed: 09-Sep-2019 15:16					
Chlordane (NOS)	0.209	0.0050	ug/L	0.400		52.1	0-200			
Surrogate: Decachlorobiphenyl	0.0151		ug/L	0.0200		75.3	30-160			
Surrogate: Decachlorobiphenyl [2C]	0.0169		ug/L	0.0200		84.6	30-160			
Surrogate: Tetrachlorometaxylyene	0.0103		ug/L	0.0200		51.7	30-160			
Surrogate: Tetrachlorometaxylyene [2C]	0.0101		ug/L	0.0200		50.4	30-160			
LCS (BHI0004-BS2)										
					Prepared: 03-Sep-2019 Analyzed: 09-Sep-2019 15:52					



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Chlorinated Pesticides - Quality Control

Batch BHI0004 - EPA 3510C SepF

Instrument: ECD6 Analyst: YZ

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BHI0004-BS2)						Prepared: 03-Sep-2019 Analyzed: 09-Sep-2019 15:52				
alpha-BHC	0.0077	0.0006	ug/L	0.0100		77.4	30-160			
beta-BHC	0.0092	0.0006	ug/L	0.0100		92.1	30-160			
gamma-BHC (Lindane)	0.0085	0.0006	ug/L	0.0100		85.2	30-160			
delta-BHC	0.0082	0.0006	ug/L	0.0100		82.0	30-160			
Heptachlor	0.0075	0.0006	ug/L	0.0100		75.4	30-160			
Aldrin	0.0094	0.0006	ug/L	0.0100		94.0	30-160			P1
Heptachlor Epoxide	0.0091	0.0006	ug/L	0.0100		90.7	30-160			
trans-Chlordane (beta-Chlordane)	0.0093	0.0006	ug/L	0.0100		93.0	30-160			
cis-Chlordane (alpha-chlordane)	0.0090	0.0006	ug/L	0.0100		89.8	30-160			
Endosulfan I	0.0090	0.0006	ug/L	0.0100		90.3	30-160			
4,4'-DDE	0.0178	0.0013	ug/L	0.0200		89.0	30-160			
Dieldrin	0.0176	0.0013	ug/L	0.0200		88.1	30-160			
Endrin	0.0142	0.0013	ug/L	0.0200		71.2	30-160			
Endosulfan II	0.0184	0.0013	ug/L	0.0200		92.2	30-160			P1
4,4'-DDD	0.0167	0.0013	ug/L	0.0200		83.7	30-160			
Endrin Aldehyde	0.0141	0.0013	ug/L	0.0200		70.4	30-160			
4,4'-DDT	0.0193	0.0013	ug/L	0.0200		96.7	30-160			
Endosulfan Sulfate	0.0200	0.0013	ug/L	0.0200		99.9	30-160			
Endrin Ketone	0.0211	0.0013	ug/L	0.0200		106	30-160			
Methoxychlor	0.0914	0.0063	ug/L	0.100		91.4	30-160			
Surrogate: Decachlorobiphenyl	0.0173		ug/L	0.0200		86.7	30-160			
Surrogate: Decachlorobiphenyl [2C]	0.0210		ug/L	0.0200		105	30-160			
Surrogate: Tetrachlorometaxylene	0.0119		ug/L	0.0200		59.7	30-160			
Surrogate: Tetrachlorometaxylene [2C]	0.0118		ug/L	0.0200		58.9	30-160			
LCS Dup (BHI0004-BSD1)						Prepared: 03-Sep-2019 Analyzed: 09-Sep-2019 15:34				
Chlordane (NOS)	0.229	0.0050	ug/L	0.400		57.3	0-200	9.50	200	
Surrogate: Decachlorobiphenyl	0.0155		ug/L	0.0200		77.4	30-160			
Surrogate: Decachlorobiphenyl [2C]	0.0157		ug/L	0.0200		78.3	30-160			
Surrogate: Tetrachlorometaxylene	0.0107		ug/L	0.0200		53.3	30-160			
Surrogate: Tetrachlorometaxylene [2C]	0.00950		ug/L	0.0200		47.5	30-160			



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Certified Analyses included in this Report

Analyte	Certifications
EPA 8081B in Water	
alpha-BHC	WADOE, DoD-ELAP, NELAP, CALAP
alpha-BHC [2C]	WADOE, DoD-ELAP, NELAP, CALAP
beta-BHC	WADOE, DoD-ELAP, NELAP, CALAP
beta-BHC [2C]	WADOE, DoD-ELAP, NELAP, CALAP
gamma-BHC (Lindane)	WADOE, DoD-ELAP, NELAP, CALAP
gamma-BHC (Lindane) [2C]	WADOE, DoD-ELAP, NELAP, CALAP
delta-BHC	WADOE, DoD-ELAP, NELAP, CALAP
delta-BHC [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Heptachlor	WADOE, DoD-ELAP, NELAP, CALAP
Heptachlor [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Aldrin	WADOE, DoD-ELAP, NELAP, CALAP
Aldrin [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Heptachlor Epoxide	WADOE, DoD-ELAP, NELAP, CALAP
Heptachlor Epoxide [2C]	WADOE, DoD-ELAP, NELAP, CALAP
trans-Chlordane (beta-Chlordane)	WADOE, DoD-ELAP, NELAP, CALAP
trans-Chlordane (beta-Chlordane) [2C]	WADOE, DoD-ELAP, NELAP, CALAP
cis-Chlordane (alpha-chlordane)	WADOE, DoD-ELAP, NELAP, CALAP
cis-Chlordane (alpha-chlordane) [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Endosulfan I	WADOE, DoD-ELAP, NELAP, CALAP
Endosulfan I [2C]	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDE	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDE [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Dieldrin	WADOE, DoD-ELAP, NELAP, CALAP
Dieldrin [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Endrin	WADOE, DoD-ELAP, NELAP, CALAP
Endrin [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Endosulfan II	WADOE, DoD-ELAP, NELAP, CALAP
Endosulfan II [2C]	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDD	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDD [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Endrin Aldehyde	WADOE, DoD-ELAP, NELAP, CALAP
Endrin Aldehyde [2C]	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDT	WADOE, DoD-ELAP, NELAP, CALAP
4,4'-DDT [2C]	WADOE, DoD-ELAP, NELAP, CALAP
Endosulfan Sulfate	WADOE, DoD-ELAP, NELAP, CALAP



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Endosulfan Sulfate [2C]	WADOE,DoD-ELAP,NELAP,CALAP
Endrin Ketone	WADOE,DoD-ELAP,NELAP,CALAP
Endrin Ketone [2C]	WADOE,DoD-ELAP,NELAP,CALAP
Methoxychlor	WADOE,DoD-ELAP,NELAP,CALAP
Methoxychlor [2C]	WADOE,DoD-ELAP,NELAP,CALAP
Hexachlorobutadiene	WADOE,DoD-ELAP,NELAP,CALAP
Hexachlorobutadiene [2C]	WADOE,DoD-ELAP,NELAP,CALAP
Hexachlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
Hexachlorobenzene [2C]	WADOE,DoD-ELAP,NELAP,CALAP
2,4'-DDE	DoD-ELAP
2,4'-DDE [2C]	DoD-ELAP
2,4'-DDD	DoD-ELAP
2,4'-DDD [2C]	DoD-ELAP
2,4'-DDT	DoD-ELAP
2,4'-DDT [2C]	DoD-ELAP
Oxychlorane	DoD-ELAP
Oxychlorane [2C]	DoD-ELAP
cis-Nonachlor	DoD-ELAP
cis-Nonachlor [2C]	DoD-ELAP
trans-Nonachlor	DoD-ELAP
trans-Nonachlor [2C]	DoD-ELAP
Mirex	DoD-ELAP
Mirex [2C]	DoD-ELAP
Toxaphene	DoD-ELAP
Toxaphene [2C]	DoD-ELAP
Chlordane, technical	DoD-ELAP
Chlordane, technical [2C]	DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	01/31/2021
CALAP	California Department of Public Health CAELAP	2748	06/30/2019
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	01/01/2021
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2020
WADOE	WA Dept of Ecology	C558	06/30/2019
WA-DW	Ecology - Drinking Water	C558	06/30/2019



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Notes and Definitions

- * Flagged value is not within established control limits.
- B This analyte was detected in the method blank.
- D The reported value is from a dilution
- E The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
- NRS This surrogate not reported due to chromatographic interference
- P1 The reported value is greater than 40% difference between the concentrations determined on two GC columns where applicable.
- U This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.