REPORT

Quarterly Monitoring Report
July 2023 Groundwater Sampling

Landsburg Mine Site

Submitted to:

Washington Department of Ecology
15700 Dayton Ave. N., Shoreline WA 98133

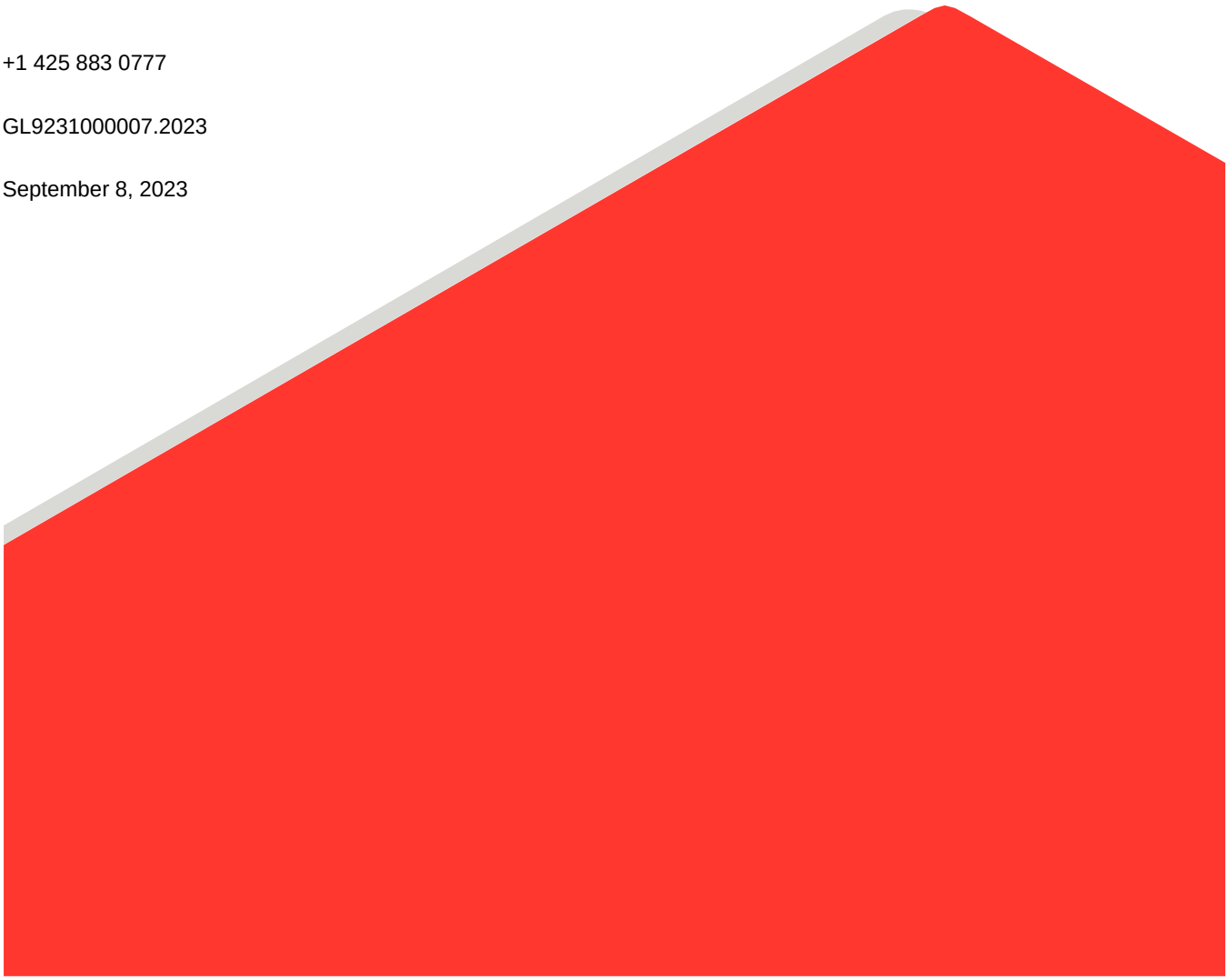
Submitted by:

WSP USA Inc.
18300 NE Union Hill Road, Suite 200, Redmond, Washington, USA 98052

+1 425 883 0777

GL9231000007.2023

September 8, 2023



Distribution List

Vance Atkins, LHG - Ecology

Landsburg PLP Group

Table of Contents

1.0 INTRODUCTION

The Compliance Monitoring Plan (CMP) (Ecology 2017) describes the long-term confirmational monitoring required after completion of remediation actions at the Landsburg Mine Site (the Site). Additionally, the Amendment to Cleanup Action Plan (Ecology 2021) stipulated that quarterly monitoring of the wells located at the north end of the Landsburg Mine Site (Site) be conducted for five years from the initial detection of 1,4-dioxane. The five years of quarterly monitoring provide 20 discrete data sampling points in each of the north end monitoring wells, which is a statistically significant number of data points to evaluate concentration trends. The following five Site wells were included in this monitoring requirement: LMW-2, LMW-4, LMW-10, LMW-12, and LMW-13. 1,4-dioxane has been previously detected in only three of these wells: LMW-2, LMW-4, and LMW-12. Figure 1 shows the well locations.

Following completion of the March 2023 sampling round, the statistical trend analysis was completed, and the results were presented to Ecology (WSP 2023). The statistical trend analyses using Mann-Kendall and Theil-Sen methods indicated that 1,4-dioxane concentrations in LMW-2 and LMW-12 were stable to decreasing. In LMW-4, 1,4-dioxane trends indicated no clear trend using the Theil-Sen statistical method and potentially increasing trends using the Mann-Kendall method. In an email response, Ecology indicated that based on the statistical trend analysis, future sampling of Site monitoring wells, except well LMW-4, shall continue at the frequency specified in the CMP (Ecology 2023). Ecology requested that quarterly monitoring of LMW-4 continue for 1,4-dioxane analysis until statistical trend analysis indicates concentrations are steady to decreasing in LMW-4. Further, Ecology requested that the semi-annual sampling of the three groundwater monitoring wells located north of the Site, LMW-20, LMW-21, and LMW-22 continue until a steady to decreasing trend can be confirmed at LMW-4.

This report presents the results of the July 2023 quarterly monitoring of LMW-4 and semi-annual sampling of LMW-20, LMW-21, and LMW-22.

2.0 SAMPLING ACTIVITIES

Groundwater sampling was conducted in accordance with the CMP (Ecology 2017), and included the following activities:

- Measurement of static water levels at monitoring wells.
- Well purging with the dedicated pumping systems and tubing installed in each well to ensure sample representativeness.
- Measurement of field parameters including pH, specific conductance, temperature, dissolved oxygen, oxidation-reduction potential (ORP), and turbidity.
- Collection of representative samples in appropriate containers provided by the analytical laboratory.
- Analyses of groundwater samples for the following parameters:
  - 1,4-Dioxane following USEPA SW-846 Method 8270E SIM

Appendix A presents the laboratory analytical data validation report with any added data qualifiers noted. Appendix B presents the laboratory analytical data. Field sampling activities were documented on Sample Integrity Data Sheets (SIDS), provided in Appendix C.

Following sample collection, all bottles were sealed, labeled, and placed in an iced cooler until delivery to the laboratory. Groundwater samples were transported under chain-of-custody procedures to Analytical Resources LLC (ARL), of Tukwila, Washington, for analyses.

The laboratory data packages underwent data validation. The data validation is provided in Appendix A. The data were found to be acceptable with no qualifications.

Table 1 presents depths to groundwater measured during the event and calculated static water level elevations. Table 2 presents the field parameter measurements and laboratory analytical results for each groundwater sample at the Site.

3.0 RESULTS

1,4-Dioxane was not detected in LMW-20, LMW-21, or LMW-22 at a laboratory reporting limit of 0.4 micrograms per liter (µg/L) and a method detection limit of 0.04 µg/L. 1,4-Dioxane was detected in LMW-4 at a reported concentration of 2.0 µg/L, which is within the range of concentrations historically reported in this well. Table 3 provides a historical summary of 1,4-dioxane concentrations reported in LMW-4

4.0 NEXT SAMPLING EVENT

The next compliance monitoring event is a confirmational monitoring event scheduled for sometime during September-October 2023, and will include sampling of all Site groundwater monitoring wells: LMW-2 through LMW-15, and sampling of the private Landsburg Estates well.

WSP USA Inc.

Autumn Pearson
Assistant Consultant

Gary Zimmerman
Vice President

AP/GLZ/ks

v:\projects_1992 projects\923-1000\gw_data & reports\2023\2023-07\report\9231000007-r-rev0-gw report-09082023.docx

5.0 REFERENCES

Washington State Department of Ecology (Ecology). 2017. Exhibit D of the Consent Decree – Compliance Monitoring Plan Landsburg Mine Site MTCA Remediation Project, Ravensdale, Washington. Prepared by WSP. June 7.

Ecology. 2021. Amendment to Cleanup Action Plan Landsburg Mine Site MTCA Remediation Project, Ravensdale, Washington. March 26.

Ecology. 2023. Email from Vance Atkins, Ecology Project Manager, Response to Landsburg Mine Site – 1,4-Dioxane Contration Trend Analysis. Landsburg Mine Site MTCA Remediation Project, Ravensdale, Washington. June 23.

WSP. 2023. 1,4-Dioxane Trend Analysis and Groundwater Monitoring Frequency at the Landsburg Mine Site. June 06

Tables

Table 1: Groundwater Elevation Data, Landsburg Mine Site, July 24, 2023

	LMW-4[1]	LMW-20	LMW-21	LMW-22
Water Depths				
Date of data collection	7/24/2023	7/24/2023	7/24/2023	7/24/2023
Time of data collection	9:00 AM	1:01 PM	12:15 PM	11:00 AM
Measured to Top of PVC (ft btc)	9.46	16.27	10.90	12.99
Surveyed Elevation				
Top of PVC (ft NAVD88)	619.27	546.8	544.09	542.86
Top of Monument (ft NAVD88)	619.89	546.92	544.36	543.13
Ground Level (ft NAVD88)	617.37	543.24	540.58	540.00
Corrected Water Elevation				
Using PVC elevation (ft NAVD88)	**609.81**	**530.53**	**533.19**	**529.87**

Notes:

[1] Data corrected to accommodate well inclination from vertical

NA = Not applicable

NC = Data not collected

ft btc = feet below top of casing

ft NAVD88 = elevation in feet NAVD88

Table 2: July 2023 Groundwater Analytical Results Landsburg Mine Site

ANALYTE	UNITS	LMW-4	LMW-20	LMW-20 Duplicate	LMW-21	LMW-22	Field Blank
		7/24/2023	7/24/2023	7/24/2023	7/24/2023	7/24/2023	7/24/2023
Field Parameter							
Temperature	°C	10.3	10.7	-	11.3	11.1	NA
pH	stnd	7.00	6.74	-	7.76	7.52	NA
Specific Conductance	uS/cm	729	292	-	355	418	NA
Dissolved Oxygen	mg/L	1.02	1.8	-	1.4	1.3	NA
ORP	mV	11.6	87	-	53	-23	NA
Turbidity	NTU	0.31	3.4	-	8.3	81	NA
Semi-Volatile Organic Compounds (SVOCs)							
1,4-Dioxane	ug/L	**2.0**	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U

Notes:
U - Analyte was not detected above the Reporting Limit (RL).
J - Analyte was detected above the Method Detection Limit (MDL) but below the RL.
Bold values indicate detections above the RL.
NA - Not Applicable

Table 3: Summary of 1,4-Dioxane Detections in Groundwater Monitoring Well LMW-4

Sample Date	LMW-4
	µg/L
11/30/2017	**2.3**
2/9/2018	**2.3**
5/24/2018	**1.5**
8/15/2018	**1.5**
12/4/2018	**1.6**
3/5/2019	**1.7**
5/22/2019	**2 (1.5)**
8/14/2019	**1.5**
12/10/2019	**1.6 (1.6)**
3/10/2020	**1.3 (1.4)**
6/25/2020	**1.8**
9/16/2020	**1.8**
11/23/2020	**2.3 (2.4)**
3/29/2021	**2.5 (2.3)**
6/2/2021	**1.8**
9/28/2021	**2.0**
12/8/2021	**1.6**
3/7/2022	**1.9**
6/7/2022	**2.2**
9/28/2022	**2.1**
12/21/2022	**2.0**
3/20/2023	**1.9**
7/24/2023	**2.0**

Notes:

U - The analyte was not detected above the laboratory method detection limit of 0.04 µg/L.

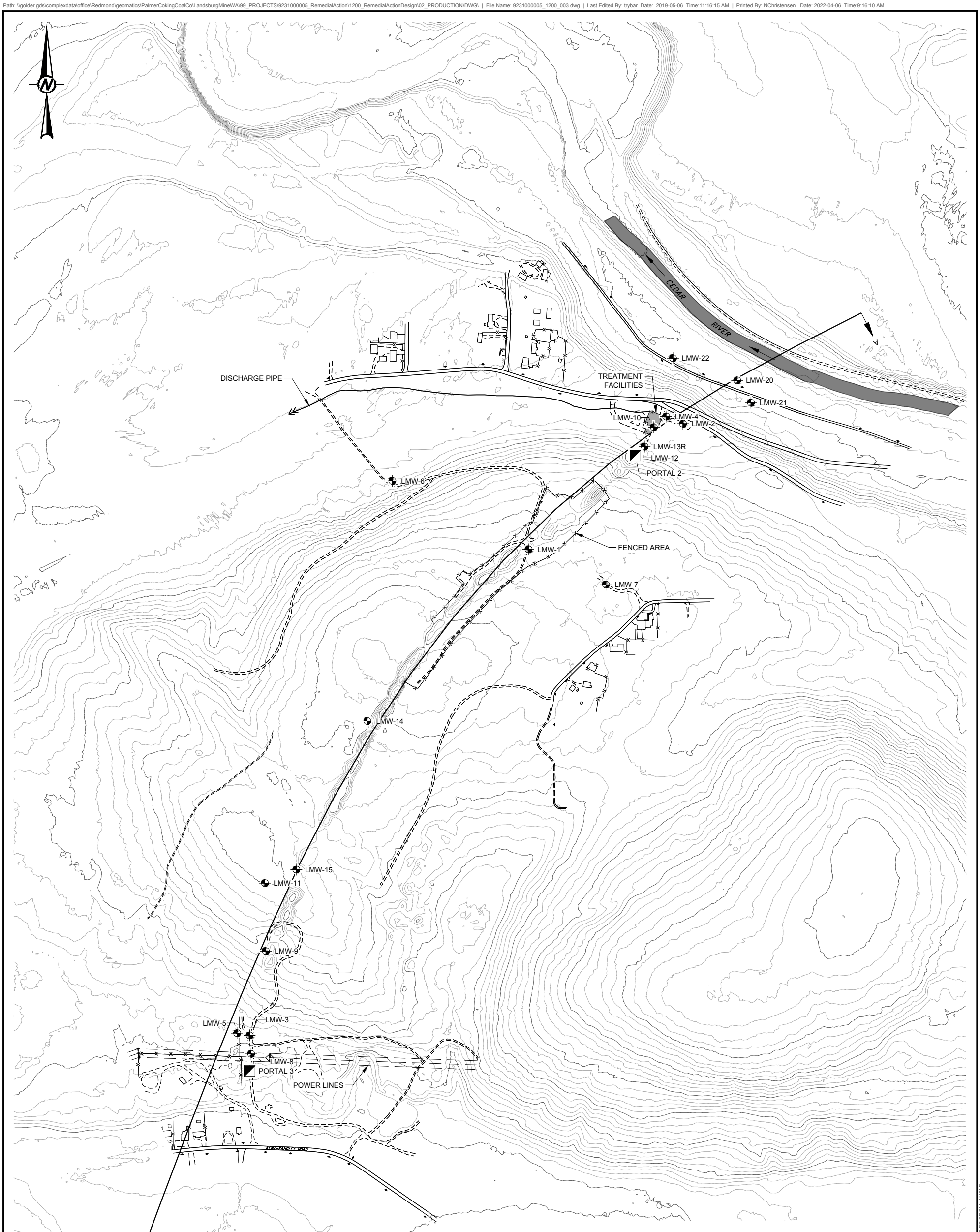
µg/L = micrograms per liter

Analyses performed by EPA Method 8270

Duplicate results are included in parentheses

MTCA Method B Cleanup Level of 1,4-Dioxane is 0.44 µg/L

Figure



LEGEND

- MONITORING WELLS
- PIEZOMETER
- PROTECTIVE FENCE
- UNPAVED ROAD
- BUILDING

NOTE(S)

1. LMW-4 AND LMW-7 WERE DRILLED AT A 20° INCLINE; LMW-14 WAS DRILLED AT 15° INCLINE

0 300 600
1" = 300' FEET

CLIENT
LANDSBURG MINE SITE PLP GROUP

CONSULTANT
wsp

YYYY-MM-DD	2019-05-06
DESIGNED	REDMOND
PREPARED	JX
REVIEWED	JX
APPROVED	GZ

PROJECT
LANDSBURG MINE SITE
MTCA REMEDIAL ACTION

TITLE
GROUNDWATER MONITORING LOCATIONS

PROJECT NO.	PHASE	REV.	FIGURE
9231000005	1200	A	1

APPENDIX A

Laboratory Analytical Report Data Validation and Quality Assurance / Quality Control Review Memorandum

Project Name: Landsburg Groundwater
Project Number/Phase/Task: GL9231000007 2023
Reviewing Company: WSP
Project Manager: Gary Zimmerman
Data Evaluator: Gary Zimmerman
Data Evaluation Date: August 14, 2023
Checked by: Michael Shadle
Review Date: August 30, 2023
Laboratory: Analytical Resources, Inc., Tukwila, WA
Lab SDG #: 23G0571

Matrix: ☒ Aqueous ☐ Soil ☐ Sediment ☐ Waste ☐ Air ☐ Other:

Analytical Methods: See Table 1.

Sample Information: See Table 1.

Work Plan or QAPP: Compliance Monitoring Plan and QAPP for Landsburg Mine Site (Exhibit D, to the Consent Decree, 2017).

Data Validation Guidance: National Functional Guidelines for Organic Superfund Methods Data Review, EPA-540-R-20-005, November 2020

COC and Sample Receipt	**YES**	**NO**	**NA**	**COMMENT**
a) COC complete and correct?	☒	☐		
b) COC documents release of custody (signed and dated)?	☒	☐		
c) Field QC types provided (note types)?	☒	☐	☐	FB, and FD; See Table 1
d) Did the cooler contents match the COC?	☒	☐		
e) Were samples received in good condition?	☒	☐		
f) Were cooler temperatures within control limits?	☒	☐		

Data Package Information	**YES**	**NO**	**NA**	**COMMENT**
a) Laboratory name and location documented?	☒	☐		
b) All samples on COC reported in data package?	☒	☐		
c) Requested analytical methods used?	☒	☐		
d) Requested sample preparation methods used?	☒	☐	☐	
e) Requested analyte list reported?	☒	☐		
f) Requested units reported?	☒	☐	☐	
g) Did the laboratory define the qualifiers used?	☒	☐		
h) Data package contains all information necessary to complete the data quality review?	☒	☐		

Analytical Assessment	**YES**	**NO**	**NA**	**COMMENT**
a) Solid samples reported on a dry-weight basis?	☐	☐	☒	
b) Were solid samples percent moisture criteria acceptable?	☐	☐	☒	
c) Were sample dilutions noted?	☒	☐		
d) Were detected concentrations less than the QL qualified by the laboratory?	☒	☐		
e) Were detected concentrations above the calibration range reported by the laboratory?	☒	☐		
f) Did the laboratory satisfy the requested sensitivity requirements?	☒	☐		

Laboratory Case Narrative	**YES**	**NO**	**NA**	**COMMENT**
a) Do the laboratory narrative or laboratory qualifiers indicate deficiencies?	☐	☒	☐	
b) Were all deficiencies noted in the laboratory qualifiers or narrative?	☐	☐	☒	

Sample Preservation and Holding Time	**YES**	**NO**	**NA**	**COMMENT**
a) Were samples properly preserved?	☒	☐		
b) Were holding times met for sample preparation?	☒	☐	☐	
c) Were holding times met for sample analysis?	☒	☐		

Blanks	**YES**	**NO**	**NA**	**COMMENTS**
a) Were blanks analyzed at the appropriate frequency?	☒	☐		
b) Were any analytes detected in the associated preparation/method blank?	☐	☒		
c) Were any analytes detected in the associated trip blanks?	☐	☐	☒	
d) Were any analytes detected in the associated field or equipment/rinsate blanks?	☐	☒	☐	
e) Were any analytes detected in the associated storage blanks?	☐	☐	☒	

Surrogates or Deuterated Monitoring Compounds	**YES**	**NO**	**NA**	**COMMENTS**
a) Were the correct surrogate compounds added to each sample?	☒	☐	☐	
b) Were surrogate recoveries within control limits?	☒	☐	☐	
c) If not, were samples analyzed at dilution factors of 20x or greater?	☐	☐	☒	

LCS/LCSD	**YES**	**NO**	**NA**	**COMMENTS**
a) Were LCS/LCSD reported at the appropriate frequency?	☒	☐		
b) Were proper analytes included in the LCS/LCSD?	☒	☐		
c) Were LCS/LCSD recoveries within control limits?	☒	☐		
d) Were RPD values within control limits (if LCSD was analyzed)?	☒	☐	☐	

MS/MSDs	**YES**	**NO**	**NA**	**COMMENTS**
a) Were project-specific MS (and MSD) reported?	☐	☐		MS/MSD not performed
b) Were proper analytes reported in the MS/MSD?	☐	☐	☒	
c) Were project-specific MS/MSD recoveries within control limits?	☐	☐	☒	
d) If not, were sample concentrations greater than 4x the spiking concentration?	☐	☐	☒	
e) Was the RPD or absolute difference within control limits (if project-specific MSD analyzed)?	☐	☐	☒	

MS/MSDs	YES	NO	NA	COMMENTS
f) Were project-specific post-digestion spikes analyzed?	☐	☐	☒	
g) Were project-specific post-digestion spike recoveries within control limits?	☐	☐	☒	

Duplicates	YES	NO	NA	COMMENTS
a) Were project-specific laboratory duplicates reported?	☒	☐	☐	
b) Was laboratory duplicate RPD or absolute difference criteria acceptable?	☒	☐	☐	
c) Were field duplicates reported?	☒	☐	☐	LMW-20-0723/LMW-20-0723-D
d) Was field duplicate RPD or absolute difference criteria acceptable?	☒	☐	☐	

ICP Serial Dilution (SD)	YES	NO	NA	COMMENTS
a) Was project-specific ICP SD data provided?	☐	☐	☒	
b) Were project-specific ICP SD within acceptable criteria?	☐	☐	☒	

Overall Evaluation	YES	NO	NA	COMMENTS
a) Were there any other technical problems not previously addressed?	☐	☒		
b) Were data acceptable and usable, except where noted?	☒	☐		

Comments/Notes:

Data qualification: NONE

Table 1: Sample Collection and Analysis Summary

Quarterly Groundwater Sampling - July 2023

SDG	Field Identification	Collection Date	Lab Identification	Matrix	QC Samples	VOCs by 8260D	1,4-Dioxane by 8270E-SIM	NWTPH HCID
23G0571	LMW-4-0723	7/24/2023 10:05	23G0571-01	GW	-		X	
23G0571	FB-1-0723	7/24/2023 10:15	23G0571-02	WQ	FB		X	
23G0571	LMW-22-0723	7/24/2023 11:28	23G0571-03	GW	-		X	
23G0571	LMW-21-0723	7/24/2023 12:45	23G0571-04	GW	-		X	
23G0571	LMW-20-0723	7/24/2023 13:26	23G0571-05	GW	-		X	
23G0571	LMW-20-0723D	7/24/2023 13:30	23G0571-06	GW	FD		X	

Notes:
All analyses performed by Analytical Resources, LLC (ARL), Tukwila WA.

Abbreviations:
GW: Groundwater
WQ: Water quality
SIM: Selective Ion Monitoring
FB: Field Blank

Table 2: Qualifier Summary Table

Quarterly Groundwater Sampling - July 2023

SDG	Sample Name	Constituent	New Result	New MDL	New RL	Qualifier	Reason
All SDGs	All Samples	All Results	--	--	--	--	Laboratory applied U-qualifiers are retained unless other qualifications are indicated in this table. All other laboratory qualifiers are removed.

Abbreviations
MDL - Method Detection Limit
MSD - Matrix Spike Duplicate
RL - Reporting Limit
SDG - Sample Delivery Group
%R - Percent Recovery

Qualifier Definitions
U: Not detected above sample concentration

APPENDIX B

Laboratory Analytical Report

Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

11 August 2023

Gary Zimmerman
Golder Associates
18300 NE Union Hill Road Suite 200
Redmond, WA 98052-3333

RE: Landsburg (Landsburg)

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.

Associated Work Order(s)	Associated SDG ID(s)
23G0571	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, LLC

Kelly Bottem, Client Services Manager

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.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006-012

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 23G0571	Turn-around Requested: Standard	Date: 24 July 2023	
ARI Client Company: Golder	Phone: 425-883-0777	Page: 1 of 1	
Client Contact: Gary Zimmerman/~~Autumn Pearson~~ Andrew Wasser		No. of Coolers: 1	Cooler Temps: 3.3°
Client Project Name: Landsburg 2023-07 Sampling			
Client Project #: GL9231000007.2023	Samplers: G. Zimmerman		

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

Sample ID	Date	Time	Matrix	No. Containers	VOCs	1,4-Dioxane	Total Priority Metal	TPH-HCID (NWTPH)	TPH-DX + TPH-Gx (HOLD)	PCBs (8082A)	Organochlorine Pesticides (8081B)	SVOCs (8270E)	Notes/Comments
	Analysis Requested												Analyze in accordance with MSA between Golder and ARI Ecology EIM EDD
LMW-4-0723	7-24-23	1005	W	2		X							
FB-1-0723		1015	W	2		X							
LMW-22-0723		1128	W	2		X							
LMW-21-0723		1245	W	2		X							
LMW-20-0723		1326	W	2		X							
LMW-20-0723D		1330	W	2		X							

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Andrew Wasser	Printed Name: Roman A.	Printed Name:	Printed Name:
	Company: WSP/Golder	Company: ARI	Company:	Company:
	Date & Time: 7/24/23 1608	Date & Time: 7/24/23 1648	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, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LMW-4-0723	23G0571-01	Water	24-Jul-2023 10:05	24-Jul-2023 16:08
FB-1-0723	23G0571-02	Water	24-Jul-2023 10:15	24-Jul-2023 16:08
LMW-22-0723	23G0571-03	Water	24-Jul-2023 11:28	24-Jul-2023 16:08
LMW-21-0723	23G0571-04	Water	24-Jul-2023 12:45	24-Jul-2023 16:08
LMW-20-0723	23G0571-05	Water	24-Jul-2023 13:26	24-Jul-2023 16:08
LMW-20-0723D	23G0571-06	Water	24-Jul-2023 13:30	24-Jul-2023 16:08

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

Work Order Case Narrative

1,4-Dioxane- EPA Method SW8270E SIM

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.

The surrogate percent recoveries were within control limits.

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

The blank spike (BS/LCS) percent recoveries were within control limits.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: WSP / Golder
Project Name: Landsburg 2023-07
COC No(s): NA
Delivered by: Fed-Ex UPS Courier Hand Delivered Other:
Assigned ARI Job No: 23G0571
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 1608 — 3.3°

If cooler temperature is out of compliance fill out form 00070F
Temp Gun ID#: 9708

Cooler Accepted by: Date: 7/24/23 Time: 1608

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		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: NC Date: 07/27/23 Time: 10:12 Labels checked by: NC

*** 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:

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

LMW-4-0723

23G0571-01 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 10:05
Instrument: NT6 Analyst: JZ — Analyzed: 08/05/2023 00:15

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-01 A 01
Preparation Batch: BLG0606 — Sample Size: 500 mL
Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	2.0	ug/L	
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*82.7*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

FB-1-0723

23G0571-02 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 10:15

Instrument: NT6 Analyst: JZ — Analyzed: 08/04/2023 23:49

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-02 A 01

Preparation Batch: BLG0606 — Sample Size: 500 mL

Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	ND	ug/L	U
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*81.5*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

LMW-22-0723

23G0571-03 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 11:28

Instrument: NT6 Analyst: JZ — Analyzed: 08/05/2023 00:41

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-03 A 01

Preparation Batch: BLG0606 — Sample Size: 500 mL

Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	ND	ug/L	U
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*77.3*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

LMW-21-0723

23G0571-04 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 12:45

Instrument: NT6 Analyst: JZ — Analyzed: 08/05/2023 01:07

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-04 A 01

Preparation Batch: BLG0606 — Sample Size: 500 mL

Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	ND	ug/L	U
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*82.6*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

LMW-20-0723

23G0571-05 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 13:26

Instrument: NT6 Analyst: JZ — Analyzed: 08/05/2023 01:32

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-05 A 01

Preparation Batch: BLG0606 — Sample Size: 500 mL

Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	ND	ug/L	U
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*76.0*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

LMW-20-0723D

23G0571-06 (Water)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM — Sampled: 07/24/2023 13:30

Instrument: NT6 Analyst: JZ — Analyzed: 08/05/2023 01:58

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 3520C (Liq Liq) — Extract ID: 23G0571-06 A 01

Preparation Batch: BLG0606 — Sample Size: 500 mL

Prepared: 07/31/2023 — Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,4-Dioxane	123-91-1	1	0.4	ND	ug/L	U
Surrogate: 1,4-Dioxane-d8			*33.6-120 %*	*80.5*	*%*	

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - SIM - Quality Control

Batch BLG0606 - EPA 8270E-SIM

Instrument: NT6 Analyst: JZ

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLG0606-BLK1)				Prepared: 31-Jul-2023 Analyzed: 04-Aug-2023 17:18						
1,4-Dioxane	ND	0.4	ug/L							U
Surrogate: 1,4-Dioxane-d8	8.68		ug/L	*10.0*		*86.8*	*33.6-120*			
LCS (BLG0606-BS1)				Prepared: 31-Jul-2023 Analyzed: 04-Aug-2023 17:44						
1,4-Dioxane	6.5	0.4	ug/L	10.0		65.1	39.9-120			
Surrogate: 1,4-Dioxane-d8	7.64		ug/L	*10.0*		*76.4*	*33.6-120*			
LCS Dup (BLG0606-BSD1)				Prepared: 31-Jul-2023 Analyzed: 04-Aug-2023 18:11						
1,4-Dioxane	7.6	0.4	ug/L	10.0		75.5	39.9-120	14.90	30	
Surrogate: 1,4-Dioxane-d8	8.59		ug/L	*10.0*		*85.9*	*33.6-120*			

Golder Associates	Project: Landsburg	
18300 NE Union Hill Road Suite 200	Project Number: Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager: Gary Zimmerman	11-Aug-2023 07:47

Certified Analyses included in this Report

Analyte	Certifications
EPA 8270E-SIM in Water	
1,4-Dioxane	WADOE,NELAP,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2025
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2025

Golder Associates	Project:	Landsburg	
18300 NE Union Hill Road Suite 200	Project Number:	Landsburg	**Reported:**
Redmond WA, 98052-3333	Project Manager:	Gary Zimmerman	11-Aug-2023 07:47

Notes and Definitions

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.

APPENDIX C

Sample Integrity Data Sheets (SIDS)

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-007.2021

Site Location Ravensdale, WA **Sample ID** LMW-22

Sampling Location Groundwater Monitoring Well - end dedicated sampling tube

Technical Procedure Reference(s) Landsburg Mine Site Compliance Monitoring Plan (2017)

Type of Sampler New Tubing and Peristaltic Pump

Date July 24, 2023 **Time** 11:28

Media Water **Station** LMW-22

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

Static Water Level: 12.99 ft BTOC

Screened Interval: 17' - 27' BGS

Sand Pack Interval: 14' - 27.3' BGS

Packer Depth: N/A

Sample Description

Field Measurements on Sample (pH, conductivity, etc.) SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount
2-500 mL	1,4-dioxane	500 mL amber bottles	None

SAMPLE INTEGRITY DATA SHEET

Well ID LMW-22
Date 07/24/2023
Time Begin Purge 11:00
Time Collect Sample 11:28

Water Level (ft bmp)	Time	pH	Cond. (uS/cm)	Temp (°C)	DO (mg/L)	ORP (rel mV)	Turbidity (NTU)
	11:05	7.51	225	12	2.2	-61	502
13.95	11:08	7.52	422	11.5	1.8	19	
13.95	11:11	7.51	421	11.1	1	6.6	221
13.93	11:14	7.5	419	11.1	0.98	0.3	168
13.89	11:17	7.51	416	11	1.09	-17	76
13.9	11:20	7.51	417	11.1	0.86	-22	81
13.9	11:23	7.52	418	11.1	1.3	-23	81

Comments:
slightly turbid water.initial purge water very turbid
Grundfos: N/A
Packer: N/A
Tank: N/A
Throttle: N/A
CPM: N/A
CID: N/A
Flow Rate: 300 mL/min

Sampler _____ **Date** July 24, 2023

Supervisor _____ **Date** _____

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-007.2021

Site Location Ravensdale, WA **Sample ID** LMW-21

Sampling Location Groundwater Monitoring Well - end dedicated sampling tube

Technical Procedure Reference(s) Landsburg Mine Site Compliance Monitoring Plan (2017)

Type of Sampler New Tubing and Peristaltic Pump

Date July 24, 2023 **Time** 00:45

Media Water **Station** LMW-21

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

Static Water Level: 10.9 ft BTOC

Screened Interval: 9.8' - 14.8' BGS

Sand Pack Interval: 6.8' - 15' BGS

Packer Depth: N/A

Sample Description

Field Measurements on Sample (pH, conductivity, etc.) SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount
2-500 mL	1,4-dioxane	500 mL amber bottles	None

SAMPLE INTEGRITY DATA SHEET

Well ID LMW-21
Date 07/24/2023
Time Begin Purge 12:17
Time Collect Sample 00:45

Water Level (ft bmp)	Time	pH	Cond. (uS/cm)	Temp (°C)	DO (mg/L)	ORP (rel mV)	Turbidity (NTU)
12	12:22	7.79	360	11.2	1.69	33	65
12.6	00:25	7.76	357	10.9	2.9	79	16
13.01	12:30	7.75	355	11.1	2.3	70	8.7
13.33	12:34	7.75	355	11.1	1.8	62	8.8
13.77	12:37	7.74	355	11.3	1.5	54	8.8
13.97	12:40	7.76	355	11.3	1.4	53	8.3

Comments:
clear water.
Grundfos: N/A
Packer: N/A
Tank: N/A
Throttle: N/A
CPM: N/A
CID: N/A
Flow Rate: 200 mL/min

Sampler _____ **Date** July 24, 2023

Supervisor _____ **Date** _____

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-007.2021

Site Location Ravensdale, WA **Sample ID** LMW-20

Sampling Location Groundwater Monitoring Well - end dedicated sampling tube

Technical Procedure Reference(s) Landsburg Mine Site Compliance Monitoring Plan (2017)

Type of Sampler New Tubing and Peristaltic Pump

Date July 24, 2023 **Time** 13:26

Media Water **Station** LMW-20

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

Static Water Level: 16.27 ft BTOC

Screened Interval: 14' - 24' BGS

Sand Pack Interval: 11' - 24.5' BGS

Packer Depth: N/A

Sample Description

Field Measurements on Sample (pH, conductivity, etc.) SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount
2-500 mL	1,4-dioxane	HDPE	None

SAMPLE INTEGRITY DATA SHEET

Well ID LMW-20
Date 07/24/2023
Time Begin Purge 13:02
Time Collect Sample 13:26

Water Level (ft bmp)	Time	pH	Cond. (uS/cm)	Temp (°C)	DO (mg/L)	ORP (rel mV)	Turbidity (NTU)
16.45	13:07	6.74	290	10.8	2.26	93	2.5
16.46	13:10	6.7	291	10.4	2	88	4.1
16.45	13:13	6.71	293	10.7	1.9	87	4.4
16.45	13:16	6.73	292	10.7	1.8	87	4.2
16.45	13:19	6.74	292	10.7	1.8	87	3.7
16.45	13:22	6.74	292	10.7	1.8	87	3.4

Comments:
clear water.duplicate taken @ 13:30 LMW-20-0723D
Grundfos: N/A
Packer: N/A
Tank: N/A
Throttle: N/A
CPM: N/A
CID: N/A
Flow Rate: 270 mL/min

Sampler _____ **Date** July 24, 2023

Supervisor _____ **Date** _____

SAMPLE INTEGRITY DATA SHEET

Plant/Site Landsburg Mine Site **Project No.** 923-1000-007.2021

Site Location Ravensdale, WA **Sample ID** LMW-4

Sampling Location Groundwater Monitoring Well - end dedicated sampling tube

Technical Procedure Reference(s) Landsburg Mine Site Compliance Monitoring Plan (2017)

Type of Sampler Dedicated Pump Grundfos

Date July 24, 2023 **Time** 10:05

Media Water **Station** LMW-4

Sample Type: **grab** time composite space composite

Sample Acquisition Measurements (depth, volume of static well water and purged water, etc.)

Static Water Level: 10.78 ft BTOC

Screened Interval: 195' - 209.7' BGS

Sand Pack Interval: 189' - 209.7' BGS

Packer Depth: 187.3' BGS

Sample Description

Field Measurements on Sample (pH, conductivity, etc.) SEE FIELD PARAMETERS SHEET

Aliquot Amount	Analysis	Container	Preservation / Amount
2-500 mL	1,4-dioxane	500 mL amber bottles	None

SAMPLE INTEGRITY DATA SHEET

Well ID LMW-4
Date 07/24/2023
Time Begin Purge 09:04
Time Collect Sample 10:05

Water Level (ft bmp)	Time	pH	Cond. (uS/cm)	Temp (°C)	DO (mg/L)	ORP (rel mV)	Turbidity (NTU)
10.07	09:45	7	725	10.2	0.78	115.0	1.19
10.07	09:50	7.01	728	10.3	0.84	42.7	0.45
10.07	09:55	7.01	729	10.3	0.92	24.4	0.60
10.07	10:00	7	729	10.3	1.02	11.6	0.31

Comments:
.Shift-up-shift to move to redi-flo2 no packer used LMW-4-0723 field blank taken FB-1-0723
Grundfos: 80 Hz
Packer: 110 psi
Tank: N/A
Throttle: N/A
CPM: N/A
CID: N/A
Flow Rate: 2000 mL/min

Sampler _____ **Date** July 24, 2023

Supervisor _____ **Date** _____

wsp.com