

April 30, 2021

Tasman Geosciences

Mike Jahn

6855 West 119th Avenue

Broomfield CO 80020

Project Name - KMG - Ludwig 17-5

Project Number - 90329145

Attached are your analytical results for KMG - Ludwig 17-5 received by Origins Laboratory, Inc. April 26, 2021. This project is associated with Origins project number Y104455-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.
303.433.1322
o-squad@oelabinc.com



Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Mike Jahn
Project Number: 90329145
Project: KMG - Ludwig 17-5

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WH-B01@8'	Y104455-01	Soil	April 26, 2021 12:30	04/26/2021 17:42
WH-BG01@8'	Y104455-02	Soil	April 26, 2021 12:36	04/26/2021 17:42

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Origins Laboratory

F-012207-01-R1
 Effective Date: 01/09/12

Sample Receipt Checklist

Origins Work Order: Y104455 Client: Tasman
 Client Project ID: Ludwig 17-5
 Checklist Completed by: JG Shipped Via: HD
 Date/time completed: 4/26/21 (UPS, FedEx, Hand Delivered, Pick-up, etc.)
 Airbill #: N/A
 Matrix(s) Received: (Check all that apply): X Soil/Solid Water Other:
 Cooler Number/Temperature: 1, 5.1 °C °C °C °C (Describe)
 Thermometer ID: T003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked ⁽¹⁾ ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)/(pH <2 for samples preserved with HNO ₃ , HCL, H ₂ SO ₄) / (pH > 10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

⁽¹⁾If NO, then contact the client before proceeding with analysis and note date, time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager)

4/26/21
 Date/Time Reviewed

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

WH-B01@8'
4/26/2021 12:30:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
---------	--------	-----------------	-------	----------	-------	---------	----------	----------	-------

AAL, Inc.
Y104455-01 (Soil)

Boron (Sorbitol)

Boron	0.2		mg/L	1	[none]		04/28/2021	04/30/2021	
-------	-----	--	------	---	--------	--	------------	------------	--

DRO/ORO by EPA 8015D

Diesel (C10-C28)	ND	25.0	mg/kg	1	B1D2609	KDK	04/26/2021	04/26/2021	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	KDK	"	"	U

Surrogate: o-Terphenyl	65.0 %	50-150			"	"	"	"	
------------------------	--------	--------	--	--	---	---	---	---	--

GBTEX + Naphthalene by EPA 8260D

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B1D2608	TEM	04/26/2021	04/26/2021	U
Benzene	ND	0.002	"	"	"	TEM	"	"	U
Toluene	ND	0.002	"	"	"	TEM	"	"	U
Ethylbenzene	ND	0.002	"	"	"	TEM	"	"	U
Xylenes, total	ND	0.002	"	"	"	TEM	"	"	U
Naphthalene	ND	0.008	"	"	"	TEM	"	"	U

Surrogate: 1,2-Dichloroethane-d4	94.6 %	70-130			"	"	"	"	
Surrogate: Toluene-d8	88.7 %	70-130			"	"	"	"	
Surrogate: 4-Bromofluorobenzene	92.8 %	70-130			"	"	"	"	

Metals (Saturated Paste Prep)

Calcium	2.74		me/L	1	[none]		04/28/2021	04/30/2021	
---------	------	--	------	---	--------	--	------------	------------	--

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

WH-B01@8'

4/26/2021 12:30:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
---------	--------	-----------------	-------	----------	-------	---------	----------	----------	-------

AAL, Inc.
Y104455-01 (Soil)

Metals (Saturated Paste Prep)

Magnesium	0.83		me/L	1	[none]		04/28/2021	04/30/2021	
Sodium	2.77		"	"	"		"	"	

pH in Soil by EPA 9045D

pH	8.09		pH Units	1	B1D2707	DJL	04/27/2021	04/27/2021	
----	------	--	----------	---	---------	-----	------------	------------	--

SAR by 20B Saturated Paste

SAR	2.07			1	[none]		04/28/2021	04/30/2021	
-----	------	--	--	---	--------	--	------------	------------	--

Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.500	0.00500	mmhos/cm	1	B1D2708	DJL	04/27/2021	04/27/2021	
---------------------------	-------	---------	----------	---	---------	-----	------------	------------	--

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

WH-BG01@8'
4/26/2021 12:36:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
---------	--------	-----------------	-------	----------	-------	---------	----------	----------	-------

AAL, Inc.
Y104455-02 (Soil)

Boron (Sorbitol)

Boron	0.2		mg/L	1	[none]		04/28/2021	04/30/2021	
-------	-----	--	------	---	--------	--	------------	------------	--

Metals (Saturated Paste Prep)

Calcium	2.46		me/L	1	[none]		"	04/30/2021	
Magnesium	1.09		"	"	"		"	"	
Sodium	6.55		"	"	"		"	"	

pH in Soil by EPA 9045D

pH	7.67		pH Units	1	B1D2707	DJL	04/27/2021	04/27/2021	
----	------	--	----------	---	---------	-----	------------	------------	--

SAR by 20B Saturated Paste

SAR	4.92			1	[none]		04/28/2021	04/30/2021	
-----	------	--	--	---	--------	--	------------	------------	--

Specific Conductance by Modified 9050A

Specific Conductance (EC)	1.05	0.00500	mmhos/cm	1	B1D2708	DJL	04/27/2021	04/27/2021	
---------------------------	------	---------	----------	---	---------	-----	------------	------------	--

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B1D2608 - EPA 5030 (soil)										
Blank (B1D2608-BLK1)										
					Prepared: 04/26/2021 Analyzed: 04/26/2021					
Gasoline Range Hydrocarbons	ND	0.200	mg/kg							U
Benzene	ND	0.002	"							U
Toluene	ND	0.002	"							U
Ethylbenzene	ND	0.002	"							U
Xylenes, total	ND	0.002	"							U
Naphthalene	ND	0.008	"							U
Surrogate: 1,2-Dichloroethane-d4	57		ug/kg	62.5		91.4	70-130			
Surrogate: Toluene-d8	55		"	62.5		88.2	70-130			
Surrogate: 4-Bromofluorobenzene	58		"	62.5		92.3	70-130			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2608 - EPA 5030 (soil)

LCS (B1D2608-BS1)

Prepared: 04/26/2021 Analyzed: 04/26/2021

Benzene	0.056	0.002	mg/kg	0.0500		112	70-130			
Toluene	0.047	0.002	"	0.0500		93.3	70-130			
Ethylbenzene	0.044	0.002	"	0.0500		88.2	70-130			
m,p-Xylene	0.089	0.004	"	0.100		89.3	70-130			
o-Xylene	0.046	0.002	"	0.0500		92.6	70-130			
Naphthalene	0.051	0.008	"	0.0500		102	70-130			
Surrogate: 1,2-Dichloroethane-d4	56		ug/kg	62.5		89.4	70-130			
Surrogate: Toluene-d8	54		"	62.5		86.8	70-130			
Surrogate: 4-Bromofluorobenzene	59		"	62.5		94.7	70-130			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2608 - EPA 5030 (soil)

Matrix Spike (B1D2608-MS1)	Source: Y104428-01			Prepared: 04/26/2021 Analyzed: 04/26/2021						
Benzene	0.053	0.002	mg/kg	0.0500	ND	106	70-130			
Toluene	0.041	0.002	"	0.0500	ND	82.3	70-130			
Ethylbenzene	0.037	0.002	"	0.0500	ND	73.3	70-130			
m,p-Xylene	0.072	0.004	"	0.100	ND	72.3	70-130			
o-Xylene	0.039	0.002	"	0.0500	ND	77.4	70-130			
Naphthalene	0.033	0.008	"	0.0500	ND	65.4	70-130			QM-07
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		93.3	70-130			
Surrogate: Toluene-d8	54		"	62.5		87.1	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		96.1	70-130			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2608 - EPA 5030 (soil)

Matrix Spike Dup (B1D2608-MSD1)	Source: Y104428-01			Prepared: 04/26/2021 Analyzed: 04/26/2021						
Benzene	0.049	0.002	mg/kg	0.0500	ND	97.8	70-130	8.20	20	
Toluene	0.039	0.002	"	0.0500	ND	77.4	70-130	6.16	20	
Ethylbenzene	0.036	0.002	"	0.0500	ND	71.4	70-130	2.54	20	
m,p-Xylene	0.071	0.004	"	0.100	ND	70.6	70-130	2.35	20	
o-Xylene	0.038	0.002	"	0.0500	ND	75.8	70-130	2.04	20	
Naphthalene	0.031	0.008	"	0.0500	ND	61.2	70-130	6.64	20	QM-07
Surrogate: 1,2-Dichloroethane-d4	57		ug/kg	62.5		91.8	70-130			
Surrogate: Toluene-d8	55		"	62.5		87.3	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		96.1	70-130			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Volatile Organic Compounds by GC/MS SW846 8260D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B1D2609 - EPA 3550B										
Blank (B1D2609-BLK1)										
					Prepared: 04/26/2021 Analyzed: 04/26/2021					
Diesel (C10-C28)	ND	25.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	100	"							U
Surrogate: o-Terphenyl	18		"	25.0		71.6	50-150			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2609 - EPA 3550B

LCS (B1D2609-BS1)

Prepared: 04/26/2021 Analyzed: 04/26/2021

Diesel (C10-C28)	1090	50.0	mg/kg	1000		109	70-130			
Residual Range Organics (C28-C40)	1080	200	"	1000		108	70-130			
Surrogate: o-Terphenyl	49		"	50.0		97.3	50-150			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2609 - EPA 3550B

Matrix Spike (B1D2609-MS1)	Source: Y104424-01			Prepared: 04/26/2021 Analyzed: 04/26/2021						
Diesel (C10-C28)	1000	50.0	mg/kg	1000	ND	100	70-130			
Residual Range Organics (C28-C40)	1040	200	"	1000	ND	104	70-130			
Surrogate: o-Terphenyl	42		"	50.0		83.8	50-150			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2609 - EPA 3550B

Matrix Spike Dup (B1D2609-MSD1)	Source: Y104424-01			Prepared: 04/26/2021 Analyzed: 04/26/2021						
Diesel (C10-C28)	967	50.0	mg/kg	1000	ND	96.7	70-130	3.41	35	
Residual Range Organics (C28-C40)	999	200	"	1000	ND	99.9	70-130	3.53	35	
Surrogate: o-Terphenyl	40		"	50.0		80.0	50-150			

Origins Laboratory, 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.

Tasman Geosciences
 6855 West 119th Avenue
 Broomfield CO 80020

Mike Jahn
 Project Number: 90329145
 Project: KMG - Ludwig 17-5

Extractable Petroleum Hydrocarbons by 8015D - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Saturated Paste - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

Batch B1D2707 - NO PREP

Duplicate (B1D2707-DUP1)

Source: Y104428-01

Prepared: 04/27/2021 Analyzed: 04/27/2021

pH	7.11		pH Units		7.45			4.67	25	
----	------	--	----------	--	------	--	--	------	----	--

Batch B1D2708 - NO PREP

Blank (B1D2708-BLK1)

Prepared: 04/27/2021 Analyzed: 04/27/2021

Specific Conductance (EC)	0.00270	0.00500	mmhos/cm							
---------------------------	---------	---------	----------	--	--	--	--	--	--	--

Duplicate (B1D2708-DUP1)

Source: Y104428-01

Prepared: 04/27/2021 Analyzed: 04/27/2021

Specific Conductance (EC)	0.485	0.00500	mmhos/cm		0.391			21.5	25	
---------------------------	-------	---------	----------	--	-------	--	--	------	----	--

Origins Laboratory, 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.

Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Mike Jahn
Project Number: 90329145
Project: KMG - Ludwig 17-5

Notes and Definitions

U Sample is Non-Detect.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, 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.