

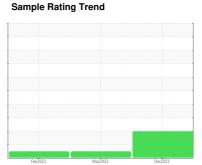
# **OIL ANALYSIS REPORT**



**2022 Mack LR64R** 

Component **Diesel Engine** 

**DIESEL ENGINE OIL SAE 40 (--- GAL)** 





## **DIAGNOSIS**

### Recommendation

No corrective action is recommended at this time. Resample at the next service interval to monitor.

All component wear rates are normal.

### Contamination

Fuel content negligible. Elemental level of silicon (Si) above normal.

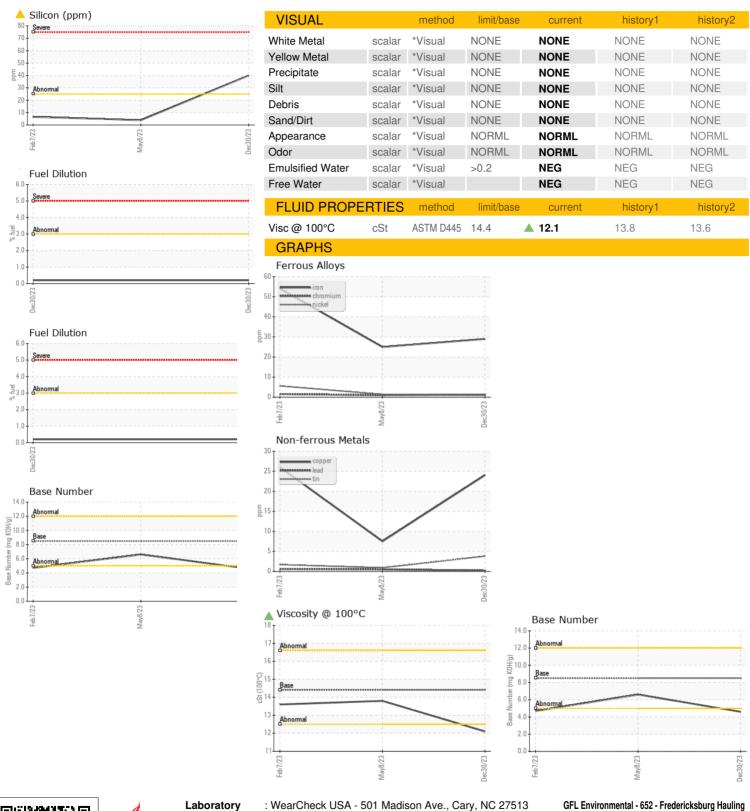
### ▲ Fluid Condition

The oil viscosity is lower than normal. The BN result indicates that there is suitable alkalinity remaining in the oil. Confirm oil type.

	AE 40 ( GAL)		Fel	2023	May2023 Dec20	23	
Sample Date         Client Info         30 Dec 2023         08 May 2023         07 Feb 2023           Machine Age         hrs         Client Info         4778         2894         2894           Oil Age         hrs         Client Info         4778         2894         2894           Oil Changed         Client Info         N/A         N/A         N/A         N/A           Sample Status         Client Info         N/A         N/A         N/A         N/A           CONTAMINATION         method         Imitibase         current         history1         history2           Water         WC Method         >0.2         NEG         NEG         NEG           WEAR METALS         method         Imitibase         current         history1         history2           Iron         ppm         ASTM D5185m         >0.2         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >20         1         1         2           Iron         ppm         ASTM D5185m         >2         -1         -1         0 <t< th=""><th>SAMPLE INFOR</th><th>MATION</th><th>method</th><th>limit/base</th><th>current</th><th>history1</th><th>history2</th></t<>	SAMPLE INFOR	MATION	method	limit/base	current	history1	history2
Sample Date         Client Info         30 Dec 2023         08 May 2023         07 Feb 2023           Machine Age         hrs         Client Info         4778         2894         2894           Oil Age         hrs         Client Info         4778         2894         2894           Oil Changed         Client Info         N/A         N/A         N/A         N/A           Sample Status         Image: Company of the	Sample Number		Client Info		GFL0098212	GFL0061478	GFL0061532
Machine Age         hrs         Client Info         4778         2894         2894           Oil Age         hrs         Client Info         4778         2894         2894           Oil Changed         Client Info         N/A         N/A         N/A           Sample Status         Moder         Image: Client Info         N/A         N/A         N/A           Water         WC Method         Image: Client Info         NEG         NEG         NEG           WEAR METALS         WC Method         -0.2         NEG         NEG         NEG           Iron         ppm         ASTM D5185m         >120         29         25         54           Chromium         ppm         ASTM D5185m         >20         1         1         2           Nikel         ppm         ASTM D5185m         >2         -1         -1         0           Aluminum         ppm         ASTM D5185m         >2         -1         -1         0           Lead         ppm         ASTM D5185m         >2         -1         -1         -1           Lead         ppm         ASTM D5185m         >20         1         -1         -1           Vanadium <td< td=""><td></td><td></td><td>Client Info</td><td></td><td>30 Dec 2023</td><td>08 May 2023</td><td>07 Feb 2023</td></td<>			Client Info		30 Dec 2023	08 May 2023	07 Feb 2023
Oil Age         hrs         Client Info         4778         2894         2894           Oil Changed         Client Info         N/A         N/A         N/A         N/A           Sample Status         Client Info         N/A         N/A         N/A         N/A           Waser         WC Method         Imitibase         current         history1         history2           Wear         WC Method         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           WEAR METALS         method         limit/base         current         history1         history2           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >20         1         1         2           Chromium         ppm         ASTM D5185m         >20         1         1         6           Chromium         ppm         ASTM D5185m         >2         -1         1         6           Chromium         ppm         ASTM D5185m         >2         -1         1         6           Chromium	•	hrs	Client Info		4778		2894
Oil Changed Sample Status         Client Info         N/A         N/A         N/A         N/A           CONTAMINATION         method         limit/base         current         history1         history2           Water         WC Method         >0.2         NEG         NEG         NEG           Glycol         WC Method         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >120         29         25         54           Chromium         ppm         ASTM D5185m         >20         1         1         2           Kickel         ppm         ASTM D5185m         >20         1         1         2           Silver         ppm         ASTM D5185m         >2         <1         <1         0           Aluminum         ppm         ASTM D5185m         >2         <1         <1         <1         <1           Copper         ppm         ASTM D5185m         >40         <1         <1         <1         <1           Current         ppm         ASTM D5185m         >330         24         8		hrs	Client Info		4778	2894	2894
ABNORMAL   NORMAL   NORMAL   CONTAMINATION   method   limit/base   current   history1   history2	-				N/A	N/A	N/A
Water         WC Method         >0.2         NEG         A         C         1         1         C         C         1         C         C         1         C         C         C         C         C         C	-				ABNORMAL	NORMAL	NORMAL
WEAR METALS	CONTAMINAT	ION	method	limit/base	current	history1	history2
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >120         29         25         54           Chromium         ppm         ASTM D5185m         >20         1         1         2           Nickel         ppm         ASTM D5185m         >5         <1	Water		WC Method	>0.2	NEG	NEG	NEG
Iron	Glycol		WC Method		NEG	NEG	NEG
Chromium         ppm         ASTM D5185m         >20         1         1         2           Nickel         ppm         ASTM D5185m         >5         <1         1         6           Titanium         ppm         ASTM D5185m         >2         <1         <1         0           Silver         ppm         ASTM D5185m         >2         <1         <1         0           Aluminum         ppm         ASTM D5185m         >2         <1         <1         1           Lead         ppm         ASTM D5185m         >40         <1         <1         <1           Copper         ppm         ASTM D5185m         >40         <1         <1         <1           Copper         ppm         ASTM D5185m         >40         <1         <1         <1         <2           Vanadium         ppm         ASTM D5185m         >15         4         <1         <2            Cadmium         ppm         ASTM D5185m         <1         <1         <0         <0            Boron         ppm         ASTM D5185m         10         <0         <0         <0         <0         <0           ADDITIVES	WEAR METAL	S	method	limit/base	current	history1	history2
Nickel	Iron	ppm	ASTM D5185m	>120	29	25	54
Titanium         ppm         ASTM D5185m         >2         <1         <1         0           Silver         ppm         ASTM D5185m         >2         <1         <1         0           Aluminum         ppm         ASTM D5185m         >2         <1         <1         0           Aluminum         ppm         ASTM D5185m         >20         1         <1         <1           Copper         ppm         ASTM D5185m         >330         24         8         26           Tin         ppm         ASTM D5185m         >15         4         <1         2           Vanadium         ppm         ASTM D5185m         0         0         0         0           Cadmium         ppm         ASTM D5185m         0         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         3         5         4           Boron         ppm         ASTM D5185m         10         0         0         0           Boron         ppm         ASTM D5185m         10         0         0 <t< td=""><td>Chromium</td><td>ppm</td><td>ASTM D5185m</td><td>&gt;20</td><td>1</td><td>1</td><td>2</td></t<>	Chromium	ppm	ASTM D5185m	>20	1	1	2
Silver	Nickel	ppm	ASTM D5185m	>5	<1	1	6
Silver	Titanium				<1	<1	
Aluminum	Silver				<1	<1	0
Lead         ppm         ASTM D5185m         >40         <1         <1         <1         <1         Clopper         ppm         ASTM D5185m         >330         24         8         26           Tin         ppm         ASTM D5185m         >15         4         <1	Aluminum		ASTM D5185m	>20			1
Copper         ppm         ASTM D5185m         >330         24         8         26           Tin         ppm         ASTM D5185m         >15         4         <1	Lead				<1	<1	<1
Tin ppm ASTM D5185m > 15				>330			
Vanadium         ppm         ASTM D5185m         <1         <1         0           Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         3         5         4           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         13         66         66           Manganese         ppm         ASTM D5185m         100         13         66         66           Manganesium         ppm         ASTM D5185m         450         154         1043         934           Calcium         ppm         ASTM D5185m         450         154         1043         934           Calcium         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         >25         40         4	• •				4		
Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         3         5         4           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         13         66         66           Manganese         ppm         ASTM D5185m         5         <1					<1		
Boron ppm ASTM D5185m 250 3 5 4  Barium ppm ASTM D5185m 10 0 0  Molybdenum ppm ASTM D5185m 10 0 13 66 66  Manganese ppm ASTM D5185m 5 <1 1  Magnesium ppm ASTM D5185m 450 154 1043 934  Calcium ppm ASTM D5185m 3000 1998 1265 1143  Phosphorus ppm ASTM D5185m 1150 865 1055 960  Zinc ppm ASTM D5185m 1350 1089 1406 1261  Sulfur ppm ASTM D5185m 4250 2814 3240 2213  CONTAMINANTS method limit/base current history1 history2  Silicon ppm ASTM D5185m >25 ▲ 40 4 7  Potassium ppm ASTM D5185m >26 4 4 7  Potassium ppm ASTM D5185m >20 6 5 2  Fuel % ASTM D7844 >4 0.5 0.7 1.3  Nitration Abs/cm *ASTM D7624 >20 8.6 9.1 12.1  Sulfation Abs/.imm *ASTM D7415 >30 22.8 21.2 23.8  FLUID DEGRADATION method limit/base current history1 history2  Oxidation Abs/.imm *ASTM D7414 >25 14.5 17.2 21.3	Cadmium						0
Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         13         66         66           Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         3000         1998         1265         1143           Calcium         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20 <th>ADDITIVES</th> <th></th> <th>method</th> <th>limit/base</th> <th>current</th> <th>history1</th> <th>history2</th>	ADDITIVES		method	limit/base	current	history1	history2
Molybdenum         ppm         ASTM D5185m         100         13         66         66           Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         450         154         1043         934           Calcium         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m	Boron	ppm	ASTM D5185m	250	3	5	4
Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         450         154         1043         934           Calcium         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D7844         >4         0.5	Barium	ppm	ASTM D5185m	10	0	0	0
Magnesium         ppm         ASTM D5185m         450         154         1043         934           Calcium         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0         <1.0           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844 <td>Molybdenum</td> <td>ppm</td> <td>ASTM D5185m</td> <td>100</td> <td>13</td> <td>66</td> <td>66</td>	Molybdenum	ppm	ASTM D5185m	100	13	66	66
Calcium         ppm         ASTM D5185m         3000         1998         1265         1143           Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D5185m         >20         6         5         2           Soot %         %         *ASTM D7844         >4         0.5         0.7         1.3           Nitr	Manganese	ppm	ASTM D5185m		5	<1	1
Phosphorus         ppm         ASTM D5185m         1150         865         1055         960           Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0	Magnesium	ppm	ASTM D5185m	450	154	1043	934
Zinc         ppm         ASTM D5185m         1350         1089         1406         1261           Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D7844         >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624         >20         8.6	Calcium	ppm	ASTM D5185m	3000	1998	1265	1143
Sulfur         ppm         ASTM D5185m         4250         2814         3240         2213           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0	Phosphorus	ppm	ASTM D5185m	1150	865	1055	960
CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0	Zinc	ppm	ASTM D5185m	1350	1089	1406	1261
Silicon         ppm         ASTM D5185m         >25         ▲ 40         4         7           Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0         <1.0           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624         >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Sulfur	ppm	ASTM D5185m	4250	2814	3240	2213
Sodium         ppm         ASTM D5185m         >216         4         4         7           Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0	CONTAMINAN	ITS	method	limit/base	current	history1	history2
Potassium         ppm         ASTM D5185m         >20         6         5         2           Fuel         %         ASTM D3524         >3.0         0.2         <1.0         <1.0           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624         >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Silicon	ppm	ASTM D5185m	>25	<b>40</b>	4	7
Fuel         %         ASTM D3524         >3.0         0.2         <1.0         <1.0           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624         >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Sodium	ppm	ASTM D5185m	>216	4	4	7
INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624         >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Potassium	ppm	ASTM D5185m	>20	6	5	2
Soot %         %         *ASTM D7844 >4         0.5         0.7         1.3           Nitration         Abs/cm         *ASTM D7624 >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415 >30         22.8         21.2         23.8           FLUID DEGRADATION method limit/base current history1 history2           Oxidation         Abs/.1mm         *ASTM D7414 >25         14.5         17.2         21.3	Fuel	%	ASTM D3524	>3.0	0.2	<1.0	<1.0
Nitration         Abs/cm         *ASTM D7624         >20         8.6         9.1         12.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION method limit/base current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	INFRA-RED		method	limit/base	current	history1	history2
Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Soot %	%	*ASTM D7844	>4	0.5	0.7	1.3
Sulfation         Abs/.1mm         *ASTM D7415         >30         22.8         21.2         23.8           FLUID DEGRADATION method limit/base current history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         14.5         17.2         21.3	Nitration	Abs/cm	*ASTM D7624	>20	8.6	9.1	12.1
Oxidation Abs/.1mm *ASTM D7414 >25 <b>14.5</b> 17.2 21.3	Sulfation	Abs/.1mm	*ASTM D7415	>30		21.2	
	FLUID DEGRAI	DATION	method	limit/base	current	history1	history2
	Oxidation	Abs/.1mm	*ASTM D7414	>25	14.5	17.2	21.3



# **OIL ANALYSIS REPORT**







Certificate L2367

Laboratory Sample No. Lab Number **Unique Number** 

: 06050407

: GFL0098212 : 10816356

Recieved : 03 Jan 2024 Diagnosed : 05 Jan 2024 Diagnostician : Don Baldridge

Test Package : FLEET ( Additional Tests: FuelDilution, PercentFuel )

To discuss this sample report, contact Customer Service at 1-800-237-1369. \* - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

GFL Environmental - 652 - Fredericksburg Hauling

10954 Houser Drive Fredericksburg, VA US 22408

Contact: WILLIAM MILO wmilo@gflenv.com

T:

F: