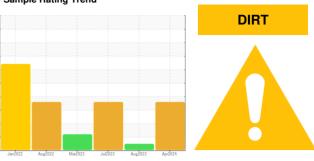


# **OIL ANALYSIS REPORT**

Sample Rating Trend



Machine Id 1982 Diesel Engine SAE 0W20 (--- GAL)

### **DIAGNOSIS**

#### Recommendation

We advise that you check the air filter, air induction system, and any areas where dirt may enter the component. Oil and filter change at the time of sampling has been noted. Resample at the next service interval to monitor.

### Wear

All component wear rates are normal.

#### Contamination

Elemental levels of silicon (Si) and aluminum (Al) indicate alumina-silicate (coarse dirt) ingress.

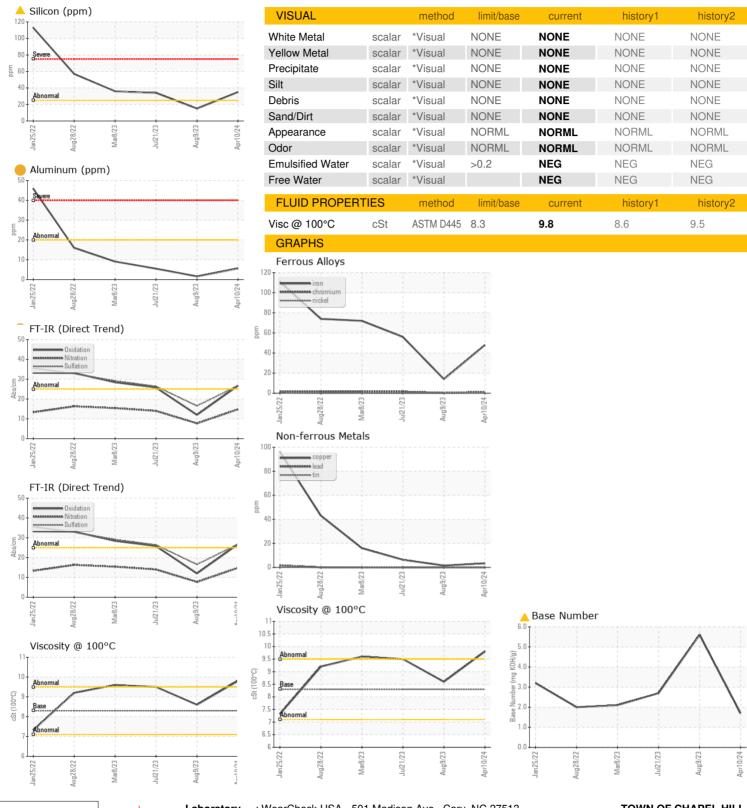
### Fluid Condition

The BN level is low.

SAMPLE INFORMATION         method         limit/base         current         history1         history2           Sample Number         Client Info         HRE0000133         WC0827105         WC0827088           Sample Date         Client Info         10 Apr 2024         09 Aug 2023         21 Jul 2023           Machine Age         mls         Client Info         0         60000         0           Oil Changed         Client Info         Changed         Changed         Changed         Changed           Sample Status         WC Method         5         < 1.0         < 1.0         < 1.0           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >0.2         NEG         NEG         NEG         NEG           Glycol         WC Method         >0.2         NEG         NEG         NEG         NEG           Iron         ppm         ASTM 05185m         >100         48         14         56           Chromium         ppm         ASTM 05185m         >20         1         < 1         2           Iron         ppm         ASTM 05185m         >0         < 1         0         0 </th <th></th> <th></th> <th>Jan2022</th> <th>Aug2022 Mar2023</th> <th>Jul2023 Aug2023</th> <th>Apr2024</th> <th></th>			Jan2022	Aug2022 Mar2023	Jul2023 Aug2023	Apr2024	
Sample Date         Client Info         10 Apr 2024         09 Aug 2023         21 Jul 2023           Machine Age         mls         Client Info         0         26418         0           Oil Age         mls         Client Info         0         6000         0           Oil Changed         Client Info         Changed         Changed         Changed         Changed           Sample Status         Client Info         Changed         Changed         Changed         Changed         Changed           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0         <1.0         <1.0         <1.0           Water         WC Method         >0.2         NEG         NEG         NEG         NEG           Glycol         WC Method         NEG         NEG         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM 05185m         >10         1         <1         2           Nickel         ppm         ASTM 05185m         >4         <1 <th>SAMPLE INFORM</th> <th>IATION</th> <th>method</th> <th>limit/base</th> <th>current</th> <th>history1</th> <th>history2</th>	SAMPLE INFORM	IATION	method	limit/base	current	history1	history2
Sample Date         Client Info         10 Apr 2024         09 Aug 2023         21 Jul 2023           Machine Age         mls         Client Info         0         26418         0           Oil Age         mls         Client Info         0         6000         0           Oil Changed         Client Info         Changed         Changed         Changed         Changed           Sample Status         Client Info         Changed         Changed         Changed         Changed         Changed           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >0.2         NEG         NEG         NEG           Water         WC Method         >0.2         NEG         NEG         NEG           Glycol         WC Method         >0.2         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM DS185m         >10.0         4         1         5           WEAR METALS         method         limit/base         current         history1         history2 <t< th=""><th>Sample Number</th><th></th><th>Client Info</th><th></th><th>HRE0000133</th><th>WC0827105</th><th>WC0827088</th></t<>	Sample Number		Client Info		HRE0000133	WC0827105	WC0827088
Machine Age         mls         Client Info         0         26418         0           Oil Age         mls         Client Info         0         6000         0           Oil Changed         Client Info         Changed         Call         Call         Q.         C.         Close         Call         Q.         C.         D.         C.			Client Info		10 Apr 2024	09 Aug 2023	21 Jul 2023
Oil Age         mls         Client Info         Changed         <	•	mls	Client Info		•	0	0
Sample Status         Method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0	Oil Age	mls	Client Info		0	6000	0
CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0	Oil Changed		Client Info		Changed	Changed	Changed
Fuel	Sample Status				ABNORMAL	NORMAL	ABNORMAL
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         >100         48         14         56           Chromium         ppm         ASTM D5185m         >20         1         <1         2           Nickel         ppm         ASTM D5185m         >4         <1         0         0           Silver         ppm         ASTM D5185m         >3         4         7         15           Aluminum         ppm         ASTM D5185m         >20         6         2         6           Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >15         0         <1         <1           Vanadium         ppm         ASTM D5185m         >16         2         7           Cadmium         ppm         ASTM D5185m         14         61         18           Barium         ppm	CONTAMINATION	J	method	limit/base	current	history1	history2
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >100         48         14         56           Chromium         ppm         ASTM D5185m         >20         1         <1         2           Nickel         ppm         ASTM D5185m         >4         <1         0         0           Silver         ppm         ASTM D5185m         >4         <1         0         0           Silver         ppm         ASTM D5185m         >3         4         7         15           Aluminum         ppm         ASTM D5185m         >20         6         2         6           Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >15         0         <1         1           Vanadium         ppm         ASTM D5185m         6         2         7           Cadmium         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         14 <th< td=""><th>Fuel</th><td></td><td>WC Method</td><td>&gt;5</td><th>&lt;1.0</th><td>&lt;1.0</td><td>&lt;1.0</td></th<>	Fuel		WC Method	>5	<1.0	<1.0	<1.0
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >100         48         14         56           Chromium         ppm         ASTM D5185m         >20         1         <1	Water		WC Method	>0.2	NEG	NEG	NEG
Iron	Glycol		WC Method		NEG	NEG	NEG
Chromium         ppm         ASTM D5185m         >20         1         <1	WEAR METALS		method	limit/base	current	history1	history2
Nickel	Iron	ppm	ASTM D5185m	>100	48	14	56
Titanium         ppm         ASTM D5185m         0         <1         0           Silver         ppm         ASTM D5185m         >3         4         7         15           Aluminum         ppm         ASTM D5185m         >20         6         2         6           Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >33         3         2         6           Tin         ppm         ASTM D5185m         >15         0         <1         <1           Vanadium         ppm         ASTM D5185m         16         2         7           Cadmium         ppm         ASTM D5185m         6         2         7           Cadmium         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Barium         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         482 <th< td=""><th>Chromium</th><td>ppm</td><td>ASTM D5185m</td><td>&gt;20</td><th>1</th><td>&lt;1</td><td>2</td></th<>	Chromium	ppm	ASTM D5185m	>20	1	<1	2
Silver         ppm         ASTM D5185m         >3         4         7         15           Aluminum         ppm         ASTM D5185m         >20         6         2         6           Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >330         3         2         6           Tin         ppm         ASTM D5185m         15         0         <1         <1           Vanadium         ppm         ASTM D5185m         6         2         7           Cadmium         ppm         ASTM D5185m         0         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganesium         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM	Nickel	ppm	ASTM D5185m	>4	<1	0	0
Aluminum         ppm         ASTM D5185m         >20         6         2         6           Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >330         3         2         6           Tin         ppm         ASTM D5185m         >15         0         <1	Titanium	ppm	ASTM D5185m		0		0
Lead         ppm         ASTM D5185m         >40         0         0         0           Copper         ppm         ASTM D5185m         >330         3         2         6           Tin         ppm         ASTM D5185m         >15         0         <1         <1           Vanadium         ppm         ASTM D5185m         6         2         7           Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         482         517         604           Calcium         ppm         ASTM D5185m         4823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455<	Silver	ppm	ASTM D5185m	>3	4		
Copper         ppm         ASTM D5185m         >330         3         2         6           Tin         ppm         ASTM D5185m         >15         0         <1	Aluminum	ppm	ASTM D5185m	>20	<u> </u>	2	6
Tin ppm ASTM D5185m >15 0 <1 <1 Vanadium ppm ASTM D5185m 6 2 7  Cadmium ppm ASTM D5185m 0 0 0 0  ADDITIVES method limit/base current history1 history2  Boron ppm ASTM D5185m 14 61 18  Barium ppm ASTM D5185m 1 0 0 2  Molybdenum ppm ASTM D5185m 289 275 288  Manganese ppm ASTM D5185m 5 <1 1  Calcium ppm ASTM D5185m 482 517 604  Calcium ppm ASTM D5185m 695 664 772  Zinc ppm ASTM D5185m 823 884 999  Sulfur ppm ASTM D5185m 2047 2455 2708  CONTAMINANTS method limit/base current history1 history2  Silicon ppm ASTM D5185m <1 0 2  INFRA-RED method limit/base current history1 history2  Soot % "ASTM D7844 >3 0.1 0 0.1  Nitration Abs/.1mm "ASTM D7415 >30 26.7 16.5 26.4  FLUID DEGRADATION method limit/base current history1 history2  Oxidation Abs/.1mm "ASTM D7414 >25 26.7 12.0 25.8	Lead	ppm	ASTM D5185m	>40	0	0	0
Vanadium         ppm         ASTM D5185m         6         2         7           Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1	Copper	ppm	ASTM D5185m	>330	3	2	6
Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1	Tin	ppm		>15			
ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1		ppm	ASTM D5185m		6	2	7
Boron         ppm         ASTM D5185m         14         61         18           Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1	Cadmium	ppm	ASTM D5185m		0	0	0
Barium         ppm         ASTM D5185m         1         0         2           Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1	ADDITIVES		method	limit/base	current	history1	history2
Molybdenum         ppm         ASTM D5185m         289         275         288           Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         482         517         604           Calcium         ppm         ASTM D5185m         1378         1425         1595           Phosphorus         ppm         ASTM D5185m         695         664         772           Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         35         15         34           Sodium         ppm         ASTM D5185m         >20         1         2         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >20         14.8         7.7         14.0           Nitration         Abs/:mm <th>Boron</th> <td>ppm</td> <td>ASTM D5185m</td> <td></td> <th>14</th> <td>61</td> <td>18</td>	Boron	ppm	ASTM D5185m		14	61	18
Manganese         ppm         ASTM D5185m         5         <1         1           Magnesium         ppm         ASTM D5185m         482         517         604           Calcium         ppm         ASTM D5185m         1378         1425         1595           Phosphorus         ppm         ASTM D5185m         695         664         772           Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         35         15         34           Sodium         ppm         ASTM D5185m         >20         1         2         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.1         0         0.1           Nitration         Abs/cm         *ASTM D7845         >30         26.7         16.5         26.4           FLUID DEGRADATION<	Barium	ppm	ASTM D5185m		1	0	2
Magnesium         ppm         ASTM D5185m         482         517         604           Calcium         ppm         ASTM D5185m         1378         1425         1595           Phosphorus         ppm         ASTM D5185m         695         664         772           Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         35         15         34           Sodium         ppm         ASTM D5185m         >20         1         2         <1           Potassium         ppm         ASTM D5185m         >20         1         2         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.1         0         0.1           Nitration         Abs/.1mm         *ASTM D7415         >30         26.7         16.5         26.4	Molybdenum	ppm	ASTM D5185m		289	275	288
Calcium         ppm         ASTM D5185m         1378         1425         1595           Phosphorus         ppm         ASTM D5185m         695         664         772           Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 35         15         ▲ 34           Sodium         ppm         ASTM D5185m         >20         1         2         <1	•	ppm	ASTM D5185m		5	<1	1
Phosphorus         ppm         ASTM D5185m         695         664         772           Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 35         15         ▲ 34           Sodium         ppm         ASTM D5185m         >20         1         2         <1	•	ppm			482	517	604
Zinc         ppm         ASTM D5185m         823         884         999           Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         35         15         34           Sodium         ppm         ASTM D5185m         >20         1         2         <1		ppm	ASTM D5185m			1425	1595
Sulfur         ppm         ASTM D5185m         2047         2455         2708           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         35         15         34           Sodium         ppm         ASTM D5185m         <1		ppm					
CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >25         ▲ 35         15         ▲ 34           Sodium         ppm         ASTM D5185m         <1	-	ppm					
Silicon         ppm         ASTM D5185m         >25         ▲ 35         15         ▲ 34           Sodium         ppm         ASTM D5185m         <1         0         2           Potassium         ppm         ASTM D5185m         >20         1         2         <1           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.1         0         0.1           Nitration         Abs/cm         *ASTM D7624         >20         14.8         7.7         14.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         26.7         16.5         26.4           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         26.7         12.0         25.8	Sulfur	ppm	ASTM D5185m		2047	2455	2708
Sodium         ppm         ASTM D5185m         <1				limit/base	current	history1	
Potassium         ppm         ASTM D5185m         >20         1         2         <1				>25			
INFRA-RED		ppm					
Soot %         %         *ASTM D7844 >3         0.1         0         0.1           Nitration         Abs/cm         *ASTM D7624 >20         14.8         7.7         14.0           Sulfation         Abs/.1mm         *ASTM D7415 >30         26.7         16.5         26.4           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414 >25         26.7         12.0         25.8	Potassium	ppm	ASTM D5185m	>20	1	2	<1
Nitration         Abs/cm         *ASTM D7624         >20         14.8         7.7         14.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         26.7         16.5         26.4           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         26.7         12.0         25.8	INFRA-RED		method	limit/base	current	history1	history2
Sulfation         Abs/.1mm         *ASTM D7415         >30         26.7         16.5         26.4           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         26.7         12.0         25.8							
FLUID DEGRADATION     method     limit/base     current     history1     history2       Oxidation     Abs/.1mm     *ASTM D7414     >25     26.7     12.0     25.8	Nitration	Abs/cm	*ASTM D7624	>20	14.8	7.7	14.0
Oxidation Abs/.1mm *ASTM D7414 >25 <b>26.7</b> 12.0 25.8	Sulfation	Abs/.1mm	*ASTM D7415	>30	26.7	16.5	26.4
	FLUID DEGRADA	TION	method	limit/base	current	history1	history2
Base Number (BN)         mg KOH/g         ASTM D2896         ▲ 1.7         5.6         ▲ 2.7	Oxidation	Abs/.1mm	*ASTM D7414	>25	26.7	12.0	25.8
	Base Number (BN)	mg KOH/g	ASTM D2896		<u> </u>	5.6	▲ 2.7



## OIL ANALYSIS REPORT







Certificate 12367

Sample No.

: HRE0000133 Lab Number : 06148472 Unique Number : 10978550 Test Package : FLEET

: WearCheck USA - 501 Madison Ave., Cary, NC 27513 Received : 15 Apr 2024 **Tested** : 16 Apr 2024

Diagnosed : 17 Apr 2024 - Jonathan Hester

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)

**TOWN OF CHAPEL HILL** 

6900 MILLHOUSE RD CHAPEL HILL, NC US 27516

Contact: Lisa DePasqua Idepasqua@townofchapelhill.org T: (919)696-4941

Contact/Location: Lisa DePasqua - TOWCHANC