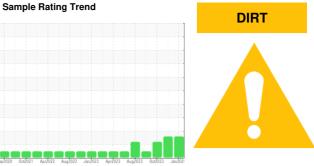


# **OIL ANALYSIS REPORT**



829027-1078

Component

**Diesel Engine** 

PETRO CANADA DURON SHP 15W40 (--- L

### **DIAGNOSIS**

#### Recommendation

No corrective action is recommended at this time. 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 level of silicon (Si) above normal indicating ingress of seal material.

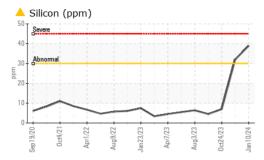
#### **Fluid Condition**

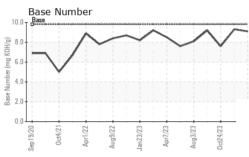
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is acceptable for the time in service.

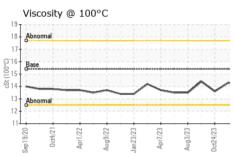
SAMPLE INFORMATION         method         limit/base         current         history1         history2           Sample Number         Client Info         GFL0103864         GFL0103829         GFL0007381           Sample Date         Client Info         10 Jan 2024         29 Dec 2023         24 Oct 2023           Amachine Age         hrs         Client Info         572         482         79963           Oil Changed         Client Info         Changed         N/A         N/A         N/A           Oil Changed Status         Client Info         Changed         N/A         ABNORMAL         ABNOR	LTR) ingless occloss April 22 August 2							
Sample Date         Client Info         10 Jan 2024         29 Dec 2023         24 Oct 2023           Machine Age         hrs         Client Info         12320         12230         79963           Oil Age         hrs         Client Info         572         482         79963           Oil Changed         Client Info         Changed ABNORMAL         N/A         N/A           Sample Status         Image: Company of the part o	SAMPLE INFORM	MATION	method	limit/base	current	history1	history2	
Machine Age         hrs         Client Info         12320         12230         79963           Oil Age         hrs         Client Info         572         482         79963           Oil Changed         Client Info         Changed         N/A         N/A           Sample Status         BABNORMAL         ABNORMAL         ABNORMAL         ABNORMAL           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0	Sample Number		Client Info		GFL0103864	GFL0103829	GFL0097381	
Oil Age         hrs         Client Info         572         482         79963           Oil Changed Sample Status         Client Info         Changed ABNORMAL ABNORMAL         N/A         N/A           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0         <1.0         <1.0           Water         WC Method         >5         <1.0         <1.0         <1.0           Glycol         WC Method         NEG         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >110         24         11         6           Chromium         ppm         ASTM D5185m         >210         24         11         6           Chromium         ppm         ASTM D5185m         >22         <1         0         0           Silver         ppm         ASTM D5185m         >22         0         0         <1         1           Silver         ppm         ASTM D5185m         >45         2         2         2         <1<	Sample Date		Client Info		10 Jan 2024	29 Dec 2023	24 Oct 2023	
Oil Changed Status         Client Info         Changed ABNORMAL ABNOR	Machine Age	hrs	Client Info		12320	12230	79963	
CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0	Oil Age	hrs	Client Info		572	482	79963	
CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >5         <1.0	-		Client Info					
Fuel	· .				ABNORMAL	ABNORMAL	ABNORMAL	
Water Glycol         WC Method         >0.2.2         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >11.0         24         11         6           Chromium         ppm         ASTM D5185m         >4         3         2         <1           Nickel         ppm         ASTM D5185m         >2         <1         0         0           Sliver         ppm         ASTM D5185m         >2         0         0         <1           Sliver         ppm         ASTM D5185m         >2         0         0         <1           Aluminum         ppm         ASTM D5185m         >2         2         2         2         2           Lead         ppm         ASTM D5185m         >45         2         2         2         1           Copper         ppm         ASTM D5185m         >4         3         1         1           Vanadium         ppm         ASTM D5185m         >4         1         0         0           Capper         ppm         ASTM D5185m	CONTAMINATI	ON	method	limit/base	current	history1	history2	
Glycol         WC Method         Imit/base         current         history1         history2           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >110         24         11         6           Chromium         ppm         ASTM D5185m         >4         3         2         <1	Fuel		WC Method	>5	<1.0	<1.0	<1.0	
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >110         24         11         6           Chromium         ppm         ASTM D5185m         >4         3         2         -1           Nickel         ppm         ASTM D5185m         >2         <1	Water		WC Method	>0.2	NEG	NEG	NEG	
Iron	Glycol		WC Method		NEG	NEG	NEG	
Chromium         ppm         ASTM D5185m         >4         3         2         <1           Nickel         ppm         ASTM D5185m         >2         <1	WEAR METALS	3	method	limit/base	current	history1	history2	
Nickel         ppm         ASTM D5185m         >2         <1         0         0           Titanium         ppm         ASTM D5185m         <1	-	ppm	ASTM D5185m	>110				
Titanium         ppm         ASTM D5185m         <1         <1         0           Silver         ppm         ASTM D5185m         >2         0         0         <1           Aluminum         ppm         ASTM D5185m         >25         3         2         2           Lead         ppm         ASTM D5185m         >45         2         2         <1           Copper         ppm         ASTM D5185m         >85         4         3         1           Tin         ppm         ASTM D5185m         >4         <1         <1         <1           Vanadium         ppm         ASTM D5185m          <1         0         0           Cadmium         ppm         ASTM D5185m          <1         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7         7           Barium         ppm         ASTM D5185m         0         5         7         7         7           Barium         ppm         ASTM D5185m         0         0         0		ppm			_			
Silver         ppm         ASTM D5185m         >2         0         0         <1           Aluminum         ppm         ASTM D5185m         >25         3         2         2           Lead         ppm         ASTM D5185m         >45         2         2         <1           Copper         ppm         ASTM D5185m         >4         3         1           Tin         ppm         ASTM D5185m         >4         1         <1         <1           Vanadium         ppm         ASTM D5185m         0         <1         0         0           Cadmium         ppm         ASTM D5185m         0         <1         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molydenum         ppm         ASTM D5185m         0         4         5         9         63           Magnesium         ppm         ASTM D5185m         1010         981         918				>2				
Aluminum         ppm         ASTM D5185m         >25         3         2         2           Lead         ppm         ASTM D5185m         >45         2         2         <1								
Lead         ppm         ASTM D5185m         >45         2         2         <1           Copper         ppm         ASTM D5185m         >85         4         3         1           Tin         ppm         ASTM D5185m         >4         <1         <1         <1           Vanadium         ppm         ASTM D5185m         <4         <1         <1         <1           Cadmium         ppm         ASTM D5185m         <4         <1         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7         7           Barium         ppm         ASTM D5185m         0         6         64         59         63           Manganesium         ppm         ASTM D5185m         0         1         <1         <1         <1           Calcium         ppm         ASTM D5185m         1010         981         918         917           Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D								
Copper         ppm         ASTM D5185m         >85         4         3         1           Tin         ppm         ASTM D5185m         >4         <1								
Tin         ppm         ASTM D5185m         >4         <1         <1         <1           Vanadium         ppm         ASTM D5185m         < <1         0         0           Cadmium         ppm         ASTM D5185m         0         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         0         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1								
Vanadium         ppm         ASTM D5185m         <1         0         0           Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         0         64         59         63           Manganese         ppm         ASTM D5185m         0         <1         <1         <1           Magnesium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1					-			
Cadmium         ppm         ASTM D5185m         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1				>4				
ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1								
Boron         ppm         ASTM D5185m         0         5         7         7           Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1         <1         <1           Magnesium         ppm         ASTM D5185m         1010         981         918         917           Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m		ppm						
Barium         ppm         ASTM D5185m         0         0         0         0           Molybdenum         ppm         ASTM D5185m         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1								
Molybdenum         ppm         ASTM D5185m         60         64         59         63           Manganese         ppm         ASTM D5185m         0         <1         <1         <1           Magnesium         ppm         ASTM D5185m         1010         981         918         917           Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base								
Manganese         ppm         ASTM D5185m         0         <1         <1         <1           Magnesium         ppm         ASTM D5185m         1010         981         918         917           Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm <td< td=""><td></td><td></td><td></td><td></td><th></th><td>-</td><td></td></td<>						-		
Magnesium         ppm         ASTM D5185m         1010         981         918         917           Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415	·				-			
Calcium         ppm         ASTM D5185m         1070         1079         1055         994           Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         >30         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method <td>•</td> <td></td> <td></td> <td></td> <th></th> <td></td> <td></td>	•							
Phosphorus         ppm         ASTM D5185m         1150         1129         1030         1020           Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >3         0.4         0.2         0.4           Nitration         Abs/.m         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION method         limit/base         current         history1         history2           Oxidation         Ab	-							
Zinc         ppm         ASTM D5185m         1270         1280         1251         1208           Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >3         0.4         0.2         0.4           Nitration         Abs/.m         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414 <td></td> <td></td> <td></td> <td></td> <th></th> <td></td> <td></td>								
Sulfur         ppm         ASTM D5185m         2060         3227         3134         2997           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3		• •						
CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3	-							
Silicon         ppm         ASTM D5185m         >30         39         32         7           Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3								
Sodium         ppm         ASTM D5185m         8         4         11           Potassium         ppm         ASTM D5185m         >20         24         10         68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3								
Potassium         ppm         ASTM D5185m         >20         24         10         ▲ 68           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3		• •		>30				
INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION method limit/base current history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3				. 20				
Soot %         %         *ASTM D7844 >3         0.4         0.2         0.4           Nitration         Abs/cm         *ASTM D7624 >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415 >30         18.2         17.7         19.0           FLUID DEGRADATION method limit/base current history1         history2           Oxidation         Abs/.1mm         *ASTM D7414 >25         13.1         12.8         14.3		ррпі						
Nitration         Abs/cm         *ASTM D7624         >20         5.5         4.9         7.0           Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION method limit/base current history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3								
Sulfation         Abs/.1mm         *ASTM D7415         >30         18.2         17.7         19.0           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3								
FLUID DEGRADATION     method     limit/base     current     history1     history2       Oxidation     Abs/.1mm     *ASTM D7414     >25     13.1     12.8     14.3								
Oxidation         Abs/.1mm         *ASTM D7414         >25         13.1         12.8         14.3				>30	18.2	17.7	19.0	
	FLUID DEGRAD	ATION	method	limit/base	current	history1	history2	
Base Number (BN)         mg KOH/g         ASTM D2896         9.8         9.1         9.3         7.6	Oxidation	Abs/.1mm	*ASTM D7414	>25	13.1	12.8	14.3	
	Base Number (BN)	mg KOH/g	ASTM D2896	9.8	9.1	9.3	7.6	



## **OIL ANALYSIS REPORT**



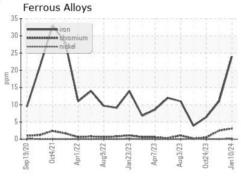


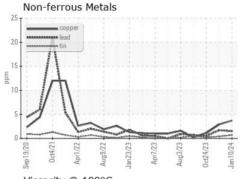


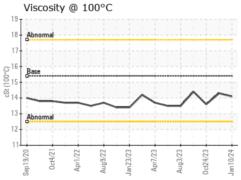
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
<b>Emulsified Water</b>	scalar	*Visual	>0.2	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG

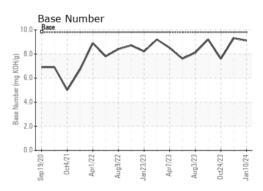
FLUID PROPE	ERITES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	15.4	14.1	14.3	13.6

#### **GRAPHS**













Certificate L2367

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

: 06060088 : 10831470

: GFL0103864 Test Package : FLEET

: WearCheck USA - 501 Madison Ave., Cary, NC 27513 Recieved : 12 Jan 2024 Diagnosed : 16 Jan 2024 Diagnostician : Doug Bogart

GFL Environmental - 654S - Midlothian

12230 Deergrove Road Midlothian, VA US 23112

Contact: Corbin Umphlet cumphlet@gflenv.com T:

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)

F: