

# Area **Tri State** [Tri State] Oil - Port Main Engine

**Port Main Engine** 

Fluid DIESEL ENGINE OIL SAE 15W40 (37 GAL)

#### DIAGNOSIS

### Recommendation

Resample at the next service interval to monitor.

#### Wear

All component wear rates are normal.

#### Contamination

There is no indication of any contamination in the oil.

## Fluid Condition

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



NORMAL

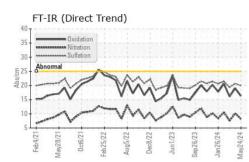
# b/021 May/021 0-cf/021 E-bi/202 Auc/2022 Dec/2022 Jun/2023 Sec/2023 Jun/204 May/

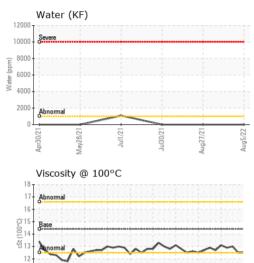
Sample Rating Trend

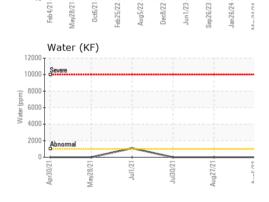
Sample Date         Client Into         24 May 2024         23 Apr 2024         20 Mar 2024           Machine Age         hrs         Client Info         23692         23077         22382           Oil Age         hrs         Client Info         590         1111         416           Oil Changed         Client Info         Not Changed         Not Changed         Not Changed         Not Changed           Sample Status         Initibase         current         history1         history2           Fuel         WC Method         >4.0         <1.0         <1.0         <1.0           Glycol         WC Method         >4.0         <1.0         <1.0         <1.0           Krom         ppm         ASTM D5185m         >7         4         8         8           Chromium         ppm         ASTM D5185m         >2         0         <1         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         <1           Silver	SAMPLE INFORM	1ATION	method	limit/base	current	history1	history2
Machine Age         hrs         Client Info         23692         23077         22382           Oil Age         hrs         Client Info         S00         1111         416           Oil Age         Kisto         Client Info         Not Changed         Not Changed         Not Changed           Sample Status         Client Info         NorMAL         NORMAL         NORMAL         NORMAL           CONTAMINATION         method         Imit/base         current         history1         history2           Fuel         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Mickel         ppm         ASTM 05185m         >8         0         <1         1           Nickel         ppm         ASTM 05185m         >2         0         <1         1           Auminum         ppm         ASTM 05185m         >18         <1         2         <1         3         3           Lead         ppm         ASTM 05185m         >18         <1         <1         <1         <1         <1         <1         <1         <1         <	Sample Number		Client Info		WC0874539	WC0719292	WC0874791
Oil Age     hrs     Client Info     590     1111     416       Oil Changed     Client Info     Not Changed     Not Changed     Not Changed       Sample Status     Imit Mode     NormAL     NormAL     NormAL       CONTAMINATION     method     Imit Mass     current     history1     history2       Fuel     WC Method     >4.0     <1.0     <1.0     <1.0       Glycol     WC Method     NEG     NEG     NEG       WEAR METALS     method     Imit/base     current     history1     history2       Iron     ppm     ASTM D5185n     >75     4     8     8       Chromium     ppm     ASTM D5185n     >2     0     <1     <1       Nickel     ppm     ASTM D5185n     >2     0     <1     <1       Aluminum     ppm     ASTM D5185n     >15     <1     3     3       Lead     ppm     ASTM D5185n     >14     0     1     1       Copper     ppm     ASTM D5185n     >14     0     1     1       Adminum     ppm     ASTM D5185n     10     0     0     0       Gorper     ppm     ASTM D5185n     10     0     0     0	Sample Date		Client Info		24 May 2024	23 Apr 2024	20 Mar 2024
Oli ChangedClient InfoNot Changd NORMALNor Changed NORMALNor Changed NORMALCONTAMINATIONmethodimit/basecurrenthistory1history2FuelWC Method>4.0<1.0<1.0<1.0<1.0GlycolWC Method>4.0<1.0<1.0<1.0<1.0WEAR METALSmethodimit/basecurrenthistory1history2IronppmASTM D5185m>75488ChromiumppmASTM D5185m>20<11NickelppmASTM D5185m>20<1<1AuminumppmASTM D5185m>20<1<1AuminumppmASTM D5185m>15<133LeadppmASTM D5185m>14011VanadiumppmASTM D5185m>140<1<1VanadiumppmASTM D5185m140<1<1ADDITIVESmethodlimit/basecurrenthistory1history2BoronppmASTM D5185m1000<1<1ASTM D5185m2500914<1<1BariumppmASTM D5185m100656896ManganeseppmASTM D5185m110102<1<1StilloonppmASTM D5185m150132412231730ZincppmASTM	Machine Age	hrs	Client Info		23692	23077	22382
Sample Status         NORMAL         NORMAL         NORMAL         NORMAL           CONTAMINATION         method         imit/base         current         history1         history2           Fuel         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         NEG         NEG         NEG         NEG         NEG           WEAR METALS         method         imit/base         current         history1         history2           Iron         ppm         ASTM D5185m<>75         4         8         8            Ohromium         ppm         ASTM D5185m<>75         4         8         8            Silver         ppm         ASTM D5185m<>2         0         <1         1            Aluminum         ppm         ASTM D5185m<>15         <1         3         3            Copper         ppm         ASTM D5185m         >16         0         1         1           Cadmium         ppm         ASTM D5185m         250         0         9	Oil Age	hrs	Client Info		590	1111	416
CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         >4.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         NEG         NEG         NEG         NEG         NEG           Warance         ppm         ASTM D5185m         >75         4         8         8           Chromium         ppm         ASTM D5185m         >2         0         <1         <1         1           Nickel         ppm         ASTM D5185m         >2         0         <1         <1         1           Auminum         ppm         ASTM D5185m         >15         <1         3         3         1	Oil Changed		Client Info		Not Changd	Changed	Not Changd
Fuel         WC Method         >4.0         <1.0	Sample Status				NORMAL	NORMAL	NORMAL
Fuel         WC Method         >4.0         <1.0	CONTAMINATION	J	method	limit/base	current	history1	history2
Glycol         WC Method         NEG         NEG         NEG           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >75         4         8         8           Chromium         ppm         ASTM D5185m         >2         0         <1         1           Nickel         ppm         ASTM D5185m         >2         0         <1         1           Silver         ppm         ASTM D5185m         >2         0         <1         1           Aduminum         ppm         ASTM D5185m         >18         <1         2         <1         1           Copper         ppm         ASTM D5185m         >14         0         1         1         1           Vanadium         ppm         ASTM D5185m         >14         0         <1         <1           Cadmium         ppm         ASTM D5185m         10         0         <1         <1           ADDITIVES         method         limit/base         current         history1         history2           Barium         ppm         ASTM D5185m         100         0         <11			WC Method	>4 0	<10		
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5165m         >75         4         8         8           Chromium         ppm         ASTM D5165m         >8         0         <1         1           Nickel         ppm         ASTM D5165m         >2         0         <1         1           Titanium         ppm         ASTM D5165m         >2         0         <1         1           Silver         ppm         ASTM D5165m         >15         <1         3         3           Lead         ppm         ASTM D5165m         >15         <1         3         3           Lead         ppm         ASTM D5165m         >16         1         <1         1           Vanadium         ppm         ASTM D5165m         >14         0         1         1           Vanadium         ppm         ASTM D5165m         250         0         9         14           Barium         ppm         ASTM D5165m         100         0         0         1           Maganese         ppm         ASTM D5165m         1527         1515         2286				2 110			
Iron         ppm         ASTM D5185m         >75         4         8         8           Chromium         ppm         ASTM D5185m         >8         0         <1         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         1           Titanium         ppm         ASTM D5185m         >2         0         <1         <1           Silver         ppm         ASTM D5185m         >2         0         <1         <1           Aluminum         ppm         ASTM D5185m         >2         0         <1         <1           Copper         ppm         ASTM D5185m         >18         <1         2         <1         <1           Cadmium         ppm         ASTM D5185m         >80         <1         3         3         1         <1         <1         <1         <1         <1         <1         <1         <1         1         <1         1	,			limit/base			
Chromium         ppm         ASTM D5185m         >8         0         <1		nnm					
Nickel         ppm         ASTM D5185m         >2         0         <1	-						
Titanium         ppm         ASTM D5185m         >3         0         <1					-		
Silver         ppm         ASTM D5185m         >2         0         <1					-		
Aluminum         ppm         ASTM D5185m         >15         <1					-		
Lead         ppm         ASTM D5185m         >18         <1					-		
Copper         ppm         ASTM D5185m         >80         <1							
Tin         ppm         ASTM D5185m         >14         0         1         1           Vanadium         ppm         ASTM D5185m         <1							
Vanadium         ppm         ASTM D5185m         <1							
Cadmium         ppm         ASTM D5185m         0         <1				>14	-		
ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         0         9         14           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         655         68         96           Magnesium         ppm         ASTM D5185m         100         655         68         96           Calcium         ppm         ASTM D5185m         100         655         68         96           Calcium         ppm         ASTM D5185m         450         1527         1515         2286           Calcium         ppm         ASTM D5185m         3000         1236         1217         1775           Phosphorus         ppm         ASTM D5185m         3000         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Solium         ppm         ASTM D5185m							
Boron         ppm         ASTM D5185m         250         0         9         14           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         655         68         96           Manganese         ppm         ASTM D5185m         100         655         68         96           Magnesium         ppm         ASTM D5185m         100         655         68         96           Magnesium         ppm         ASTM D5185m         100         c1         0         <1		ppm	ASTM DS185m		U	<1	<1
Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         65         68         96           Manganese         ppm         ASTM D5185m         100         65         68         96           Magnesium         ppm         ASTM D5185m         450         1527         1515         2286           Calcium         ppm         ASTM D5185m         3000         1236         1217         1775           Phosphorus         ppm         ASTM D5185m         150         1132         1223         1730           Zinc         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         <1         3         2           Water         %         ASTM D584 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>							
Molybdenum         ppm         ASTM D5185m         100         65         68         96           Manganese         ppm         ASTM D5185m          <1							
Manganese         ppm         ASTM D5185m         <1	Boron		ASTM D5185m	250	0	9	14
Magnesium         ppm         ASTM D5185m         450         1527         1515         2286           Calcium         ppm         ASTM D5185m         3000         1236         1217         1775           Phosphorus         ppm         ASTM D5185m         1150         1132         1223         1730           Zinc         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         <1         3         2           Water         %         ASTM D5304         >0.1         NEG         NEG         NEG           Nitration         Abs/.1mm         *ASTM D7844	Boron Barium	ppm	ASTM D5185m ASTM D5185m	250 10	0 0	9	14 0
Calcium         ppm         ASTM D5185m         3000         1236         1217         1775           Phosphorus         ppm         ASTM D5185m         1150         1132         1223         1730           Zinc         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         <1         0         2           Vater         %         ASTM D5185m         >20         <1         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1	Boron Barium Molybdenum	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m	250 10	0 0 65	9 0 68	14 0 96
Phosphorus         ppm         ASTM D5185m         1150         1132         1223         1730           Zinc         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         <1	Boron Barium Molybdenum Manganese	ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100	0 0 65 <1	9 0 68 0	14 0 96 <1
Zinc         ppm         ASTM D5185m         1350         1384         1340         1981           Sulfur         ppm         ASTM D5185m         4250         4172         3603         6044           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >20         3         2         2           Potassium         ppm         ASTM D5185m         >20         <1         3         2           Water         %         ASTM D6304         >0.1         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.mm<*ASTM D7415         >30         19.9         20.7	Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450	0 0 65 <1 1527	9 0 68 0 1515	14 0 96 <1 2286
SulfurppmASTM D5185m4250417236036044CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>20357SodiumppmASTM D5185m>158<102PotassiumppmASTM D5185m>20<132Water%ASTM D6304>0.1NEGNEGNEGINFRA-REDmethodlimit/basecurrenthistory1history2Soot %%*ASTM D78440.10.10.1NitrationAbs/cm*ASTM D7624>208.110.27.6SulfationAbs/.imm*ASTM D7415>3019.920.719.3FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2OxidationAbs/.imm*ASTM D7414>2516.319.016.1	Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000	0 0 65 <1 1527 1236	9 0 68 0 1515 1217	14 0 96 <1 2286 1775
CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>20357SodiumppmASTM D5185m>158<102PotassiumppmASTM D5185m>20<132Water%ASTM D6304>0.1NEGNEGNEGINFRA-REDmethodlimit/basecurrenthistory1history2Soot %%*ASTM D78440.10.10.1NitrationAbs/cm*ASTM D7624>208.110.27.6SulfationAbs/.imm*ASTM D7415>3019.920.719.3FLUID DEGRADATIONmethodlimit/basecurrenthistory1history2OxidationAbs/.imm*ASTM D7414>2516.319.016.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150	0 0 65 <1 1527 1236 1132	9 0 68 0 1515 1217 1223	14 0 96 <1 2286 1775 1730
Silicon         ppm         ASTM D5185m         >20         3         5         7           Sodium         ppm         ASTM D5185m         >158         <1         0         2           Potassium         ppm         ASTM D5185m         >20         <1         3         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.tmm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.tmm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350	0 0 65 <1 1527 1236 1132 1384	9 0 68 0 1515 1217 1223 1340	14 0 96 <1 2286 1775 1730 1981
Sodium         ppm         ASTM D5185m         >158         <1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250	0 0 65 <1 1527 1236 1132 1384	9 0 68 0 1515 1217 1223 1340 3603	14 0 96 <1 2286 1775 1730 1981 6044
Potassium         ppm         ASTM D5185m         >20         <1	Boron Barium Molybdenum Maganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250	0 0 65 <1 1527 1236 1132 1384 4172 current	9 0 68 0 1515 1217 1223 1340 3603 history1	14 0 96 <1 2286 1775 1730 1981 6044 history2
Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.1mm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m <b>method</b>	250 10 100 450 3000 1150 1350 4250 <b>limit/base</b> >20	0 0 65 <1 1527 1236 1132 1384 4172 current 3	9 0 68 0 1515 1217 1223 1340 3603 history1 5	14 0 96 <1 2286 1775 1730 1981 6044 history2 7
INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.1         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.tmm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.tmm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158	0 0 65 <1 1527 1236 1132 1384 4172 current 3 <1	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2
Soot %         %         *ASTM D7844         0.1         0.1         0.1           Nitration         Abs/cm         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.1mm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158 >20	0 0 65 <1 1527 1236 1132 1384 4172 <u>current</u> 3 <1 <1	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3	14 0 96 <1 2286 1775 1730 1981 6044 <b>history2</b> 7 2 2 2
Nitration         Abs/cm         *ASTM D7624         >20         8.1         10.2         7.6           Sulfation         Abs/.1mm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158 >20 >0.1	0 0 65 <1 1527 1236 1132 1384 4172 <u>current</u> 3 <1 <1	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG	14 0 96 <1 2286 1775 1730 1981 6044 <b>history2</b> 7 2 2 2
Sulfation         Abs/.1mm         *ASTM D7415         >30         19.9         20.7         19.3           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158 >20 >0.1	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 <1 NEG	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2 2 2 NEG
FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         16.3         19.0         16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158 >20 >0.1	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 ×1 NEG	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG history1	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2 2 2 NEG NEG 0.1
Oxidation Abs/.1mm *ASTM D7414 >25 16.3 19.0 16.1	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>limit/base</b> >20 >158 >20 >0.1	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 <1 NEG <i>current</i> 0.1	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG history1 0.1	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2 2 2 NEG NEG 0.1
	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot %	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >158 >20 >0.1 <b>imit/base</b>	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 ×1 NEG <i>current</i> 0.1 8.1	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG NEG history1 0.1 10.2	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2 2 2 NEG history2 0.1 7.6
Base Number (BN) mg KOH/g ASTM D2896 8.5 12.61 12.47 13.11	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Vater INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>binit/base</b> >20 >0.1 <b>binit/base</b> >20 >0.2 30	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 ×1 NEG <i>current</i> 0.1 8.1 19.9	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG history1 0.1 0.1 10.2 20.7	14 0 96 <1 2286 1775 1730 1981 6044 <b>history2</b> 7 2 2 NEG <b>history2</b> 0.1 7.6 19.3
	Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Vater INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 <b>imit/base</b> >20 >0.1 <b>imit/base</b> >20 >30 <b>imit/base</b>	0 0 65 <1 1527 1236 1132 1384 4172 <i>current</i> 3 <1 <1 ×1 NEG 0.1 8.1 19.9 <i>current</i>	9 0 68 0 1515 1217 1223 1340 3603 history1 5 0 3 NEG history1 0.1 10.2 20.7 history1	14 0 96 <1 2286 1775 1730 1981 6044 history2 7 2 2 NEG NEG 0.1 7.6 19.3 19.3



# **OIL ANALYSIS REPORT**



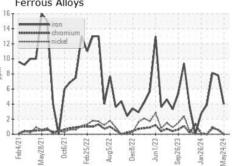


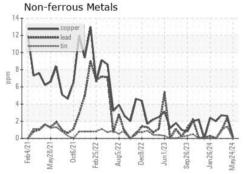


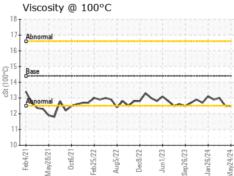
10

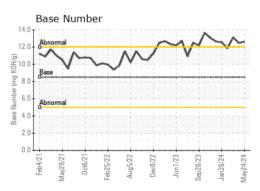
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG
FLUID PROPERT	IES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	14.4	12.5	12.5	13.0
GRAPHS						

Ferrous Alloys









Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513 MARATHON PETROLEUM CO. Sample No. : WC0874539 Received : 06 Jun 2024 101 12TH ST Lab Number : 06201658 Tested : 11 Jun 2024 CATLETTSBURG, KY Unique Number : 11063781 Diagnosed : 11 Jun 2024 - Sean Felton US 41169 Test Package : IND 2 (Additional Tests: KF) Contact: CORY GUMBERT Certificate 12367 cagumbert@marathonpetroleum.com To discuss this sample report, contact Customer Service at 1-800-237-1369. T: (606)585-3950 \* - Denotes test methods that are outside of the ISO 17025 scope of accreditation. F: x:

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

 Report Id: MARCAT [WUSCAR] 06201658 (Generated: 06/11/2024 09:40:21) Rev: 1
 Submitted

Submitted By: M/V MAP RUNNER

Page 2 of 2