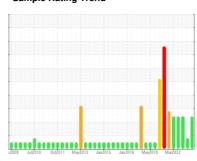


OIL ANALYSIS REPORT

Sample Rating Trend





NOVA 60039

Component

Rear Diesel Engine

VALVOLINE 15W40 (24 LTR)

DIAGNOSIS

Recommendation

We advise that you check the fuel injection system. The oil change at the time of sampling has been noted. We recommend an early resample to monitor this condition.

Wear

All component wear rates are normal.

Contamination

There is a high amount of fuel present in the oil. Tests confirm the presence of fuel in the oil.

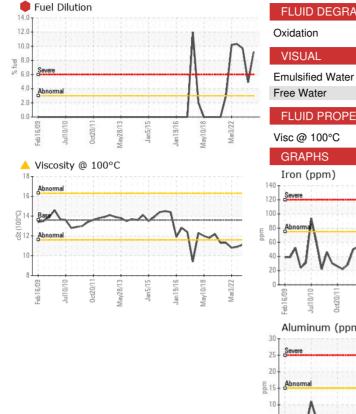
Fluid Condition

Fuel is present in the oil and is lowering the viscosity. The oil is no longer serviceable due to the presence of contaminants.

Machine Age kms Client Info 925288 905357 883738 Oil Age kms Client Info 7000 10000 10000 Oil Changed Client Info Changed Changed Changed Sample Status SEVERE ABNORMAL SEVERE CONTAMINATION method limit/base current history1 history2 Water WC Method NEG NEG NEG NEG WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185[m] >75 20 31 32 Chromium ppm ASTM D5185[m] >5 1 2 2 Nickel ppm ASTM D5185[m] >2 0 <1 0 Alluminum ppm ASTM D5185[m] >2 0 <1 0 Alluminum ppm ASTM D5185[m] >2 0 <1 0 Apeper ppm	52009 Ju2010 Osc2011 May2013 Jan2015 Jan2016 May2018 May2018 May2022										
Sample Date Client Info 10 Jan 2024 15 Sep 2023 23 Mar 2023 Machine Age kms Client Info 7000 10000 10000 10000 Changed Changed Changed Changed Changed Changed Changed SEVERE ABNORMAL SEVERE ABNORMAL SEVERE CONTAMINATION method Imit/base current history1 history2 MEG NEG NEG	SAMPLE INFORM	MATION	method	limit/base	current	history1	history2				
Sample Date Client Info 10 Jan 2024 15 Sep 2023 23 Mar 2023 Machine Age kms Client Info 7000 10000 10000 10000 Changed Changed Changed Changed Changed Changed Changed SEVERE ABNORMAL SEVERE ABNORMAL SEVERE CONTAMINATION method Imit/base current history1 history2 MEG NEG NEG	Sample Number		Client Info		WC0887276	WC0809080	WC0770743				
Oil Age kms Client Info 7000 10000 10000 Oil Changed Client Info Changed Ch	Sample Date		Client Info		10 Jan 2024	15 Sep 2023	23 Mar 2023				
Contained Client Info Changed Changed Changed Severe ABNORMAL Severe Severe ABNORMAL Severe Severe ABNORMAL Severe CONTAMINATION method limit/base current history1 history2 Mater WC Method NEG NEG	Machine Age	kms	Client Info		925288		883738				
Several Sev	Oil Age	kms	Client Info		7000	10000	10000				
Mater	Oil Changed		Client Info		Changed	Changed	Changed				
Water Glycol WC Method WC Method >0.2 NEG NEG NEG NEG NEG NEG NEG WEAR METALS method with WC Method Image NEG NEG NEG NEG NEG NEG NEG NEG NEG WEAR METALS method with WC Method Image with WC Method NEG NEG NEG NEG NEG NEG NEG WEAR METALS method with MC Method Image with MC Method VEX WITH METALS WITH META	Sample Status				SEVERE	ABNORMAL	SEVERE				
WEAR METALS	CONTAMINATIO	N	method	limit/base	current	history1	history2				
WEAR METALS	Water		WC Method	>0.2	NEG	NEG	NEG				
Iron	Glycol		WC Method		NEG	NEG	NEG				
Chromium ppm ASTM D5185(m) >5 1 2 2 Nickel ppm ASTM D5185(m) >4 <1 <1 <1 Tittanium ppm ASTM D5185(m) >2 0 0 <1 Silver ppm ASTM D5185(m) >2 0 <1 0 Aluminum ppm ASTM D5185(m) >15 6 3 7 Lead ppm ASTM D5185(m) >25 1 9 4 Copper ppm ASTM D5185(m) >100 2 2 2 Tin ppm ASTM D5185(m) 0 0 <1 1 Antimony ppm ASTM D5185(m) 0 0 <1 1 Vanadium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 ADDTTVES ppm ASTM D5185(m) 39 1 <td< th=""><th>WEAR METALS</th><th></th><th>method</th><th>limit/base</th><th>current</th><th>history1</th><th>history2</th></td<>	WEAR METALS		method	limit/base	current	history1	history2				
Nickel	Iron	ppm	ASTM D5185(m)	>75	20	31	32				
Titanium	Chromium	ppm	ASTM D5185(m)	>5	1	2	2				
Silver	Nickel	ppm	ASTM D5185(m)	>4	<1	<1	<1				
Aluminum ppm ASTM D5185(m) >15 6 3 7 Lead ppm ASTM D5185(m) >25 1 9 4 Copper ppm ASTM D5185(m) >100 2 2 2 Tin ppm ASTM D5185(m) >4 <1 <1 1 Antimony ppm ASTM D5185(m) 0 0 0 <1 Vanadium ppm ASTM D5185(m) 0 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 49 56 59 60 Manganesium ppm ASTM D5185(m) 49 56 <	Titanium	ppm	ASTM D5185(m)	>2	0	0	<1				
Lead ppm ASTM D5185(m) >25 1 9 4 Copper ppm ASTM D5185(m) >100 2 2 2 Tin ppm ASTM D5185(m) >4 <1 <1 1 Antimony ppm ASTM D5185(m) 0 0 0 <1 Vanadium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 39 1 3 9 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 49 56 59 60 Manganesium ppm ASTM D5185(m) 1 0 <1 <1 Calcium ppm ASTM D5185(m) 1554 984	Silver	ppm	ASTM D5185(m)	>2	0	<1	0				
Copper ppm ASTM D5185(m) >100 2 2 2 Tin ppm ASTM D5185(m) >4 <1	Aluminum	ppm	ASTM D5185(m)	>15	6	3	7				
Tin ppm ASTM D5185(m) >4 <1 <1 1 Antimony ppm ASTM D5185(m) 0 0 0 <1 Vanadium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 1 0 0 0 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 49 56 59 60 Manganesium ppm ASTM D5185(m) 1 0 0 <1 <1 <1 Magnesium ppm ASTM D5185(m) 1 0 0 <1 1 <1 Magnesium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D5185(m) >20 <1 2 1 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Lead	ppm	ASTM D5185(m)	>25	1	9	4				
Antimony ppm ASTM D5185(m) 0 0 <1 Vanadium ppm ASTM D5185(m) 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1	Copper	ppm	ASTM D5185(m)	>100	2	2	2				
Vanadium ppm ASTM D5185(m) 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 1 0 0 0 Manganese ppm ASTM D5185(m) 49 56 59 60 Manganesium ppm ASTM D5185(m) 1 0 <1 <1 Calcium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 2624 2475 2336 2439	Tin	ppm	ASTM D5185(m)	>4	<1	<1	1				
Beryllium ppm ASTM D5185(m) 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 1 0 0 0 Manganese ppm ASTM D5185(m) 1 0 1 <1 Magnesium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) >25 4	Antimony	ppm	ASTM D5185(m)		0	0	<1				
Cadmium ppm ASTM D5185(m) 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1	Vanadium	ppm	ASTM D5185(m)		0	0	0				
ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1	Beryllium	ppm	ASTM D5185(m)		0	0	0				
Boron ppm ASTM D5185(m) 39 1 3 9 Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1 <1 Magnesium ppm ASTM D5185(m) 1 0 <1 <1 Magnesium ppm ASTM D5185(m) 1 554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D5185(m) >20 <1 2 1 INFRA-RED method limit/base current history1 history2 Nitration ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7844* >6 1 1.4 1 Nitration 1 10.0 0	Cadmium	ppm	ASTM D5185(m)		0	0	0				
Barium ppm ASTM D5185(m) 1 0 0 0 Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1	ADDITIVES		method	limit/base	current	history1	history2				
Molybdenum ppm ASTM D5185(m) 49 56 59 60 Manganese ppm ASTM D5185(m) 1 0 <1 <1 Magnesium ppm ASTM D5185(m) 616 916 945 894 Calcium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 1554 984 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1 <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >20 <1 2 6 6 Sodium <td>Boron</td> <td>ppm</td> <td>ASTM D5185(m)</td> <td>39</td> <th>1</th> <td>3</td> <td>9</td>	Boron	ppm	ASTM D5185(m)	39	1	3	9				
Manganese ppm ASTM D5185(m) 1 0 <1 <1 Magnesium ppm ASTM D5185(m) 616 916 945 894 Calcium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) >20 <1	Barium	ppm	ASTM D5185(m)	1	0	0	0				
Magnesium ppm ASTM D5185(m) 616 916 945 894 Calcium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1 <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D7593* >3.0 9.2 4.9 9.7 INFRA-RED method <	Molybdenum	ppm	ASTM D5185(m)	49	56	59	60				
Calcium ppm ASTM D5185(m) 1554 984 1037 1118 Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1	Manganese	ppm	ASTM D5185(m)	1	0	<1	<1				
Phosphorus ppm ASTM D5185(m) 899 1015 1003 993 Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1	Magnesium	ppm	ASTM D5185(m)	616	916	945	894				
Zinc ppm ASTM D5185(m) 1069 1121 1147 1119 Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) 20 <1 2 1 Fuel % ASTM D7593* >3.0 9.2 4.9 9.7 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Calcium	ppm	ASTM D5185(m)	1554	984	1037	1118				
Sulfur ppm ASTM D5185(m) 2624 2475 2336 2439 Lithium ppm ASTM D5185(m) 2624 2475 2336 2439 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) 2 6 6 Potassium ppm ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D7593* >3.0 9.2 4.9 9.7 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Phosphorus	ppm	ASTM D5185(m)	899	1015	1003	993				
Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) 2 6 6 Potassium ppm ASTM D5185(m) >20 <1	Zinc	ppm	ASTM D5185(m)	1069	1121	1147	1119				
CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) 2 6 6 Potassium ppm ASTM D5185(m) >20 <1	Sulfur	ppm	ASTM D5185(m)	2624	2475	2336	2439				
Silicon ppm ASTM D5185(m) >25 4 5 6 Sodium ppm ASTM D5185(m) 2 6 6 Potassium ppm ASTM D5185(m) >20 <1	Lithium		ASTM D5185(m)		<1	<1	<1				
Sodium ppm ASTM D5185(m) 2 6 6 Potassium ppm ASTM D5185(m) >20 <1 2 1 Fuel % ASTM D7593* >3.0 9.2 ▲ 4.9 ● 9.7 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	CONTAMINANTS	;	method	limit/base	current	history1	history2				
Potassium ppm ASTM D5185(m) >20 <1	Silicon	ppm	ASTM D5185(m)	>25	4	5	6				
Fuel % ASTM D7593* >3.0 ● 9.2 ▲ 4.9 ● 9.7 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Sodium	ppm	ASTM D5185(m)		2	6	6				
INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Potassium	ppm	ASTM D5185(m)	>20	<1	2	1				
Soot % % ASTM D7844* >6 1 1.4 1 Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Fuel	%	ASTM D7593*	>3.0	9.2	4.9	9.7				
Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	INFRA-RED		method	limit/base	current	history1	history2				
Nitration Abs/cm ASTM D7624* >20 10.5 12.7 13.1	Soot %	%	ASTM D7844*	>6	1	1.4	1				
	Nitration	Abs/cm		>20	10.5	12.7	13.1				
	Sulfation	Abs/.1mm		>30			26.9				



OIL ANALYSIS REPORT



FLUID DEGRADA	ATION	method	limit/base	current	history1	history
Oxidation	Abs/.1mm	ASTM D7414*	>25	18.4	27.7	22.2
VISUAL		method	limit/base	current	history1	history
Emulsified Water	scalar	Visual*	>0.2	NEG	NEG	NEG
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPER	ΓIES	method	limit/base	current	history1	history
Visc @ 100°C	cSt	ASTM D7279(m)	13.6	11.0	12.4	<u>▲</u> 11.1
GRAPHS						
Iron (ppm)	neer grann		60	Lead (ppm)	111711111	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Severe			50	Severe		
Abnorma		Λ	40			
		1	₹30 1 20	Abnormal		
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	10	, m		\sim	~~~	\sim
Feb16/09 Jul10/10 Oct20/11	Jan5/15	Jan19/16 May10/18	VI dl 3/21	Feb16/09 Jul10/10 Oct20/11	May28/13	Jan 19/16 May10/18 Mar3/22
Aluminum (ppm)		~ × ·	_	Chromium (p	2	· 2
Sman			12	I 1000000000000		
Severe O			10	Severe		
Abnormal			Edd 6	Abnorma		
Λ	A	M	4	Abnoma		\wedge
~~~		$\sim$ $^{\vee}$	W 2	VV	~~~	~/ ^
- 07/0	Jan5/15+	- 91/18 	77	01/0	Jan5/15	3/78
Feb16/09 Jul10/10 Oct20/11	Jan	Jan 19/16 May 10/18	N A	Feb16/09 Jul10/10 Oct20/11	May28/13	May10/18
Copper (ppm)			100	Silicon (ppm)		
Severe			80	100000000000000000000000000000000000000		
			60			Λ
Abnormal			Ed 40	Severe		
Λ			20	Abnormal		-/-
~~~	~~^		0		_/\	~ \
Juli 0/10 - 0ct20/11 - 0ct20/11 - 0ct20/13 -	Jan5/15	Jan19/16 May10/18	11dl 3/22	Juli 0/10	May28/13	Jan 19/18 May10/18
Carporal May 28/13	,	J. M.	-	Fuel Dilution	ž ,	ž Ž
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Abnormal		******	12.0	100000000000000000000000000000000000000		
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Abnormal		nm	→ × 6.0 4.0	Severe		
•		V	2.0	Abnormal		11 /
Jul10/10 Oct20/11 May28/13	Jan5/15	Jan19/16	0.0	Jul10/10 Oct20/11	May28/13 Jan5/15	May10/18 Mar3/22
9 /0 /0	LO	6 0	ñ	9 0	80 15	3 0 6



CALA ISO 17025:2017 Accredited Laboratory

Laboratory Sample No. Lab Number Unique Number : 5709761

: WC0887276

To discuss this sample report, contact Customer Service at 1-800-268-2131.

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 Recieved : 02608675

: 15 Jan 2024 Diagnosed : 16 Jan 2024

Diagnostician : Wes Davis Test Package : MOB 1 (Additional Tests: PercentFuel)

CITY OF PETERBOROUGH 791 WEBBER AVENUE,, MUNICIPAL OPERATIONS CENTRE PETERBOROUGH, ON

> CA K9J 8N3 Contact: Frank Curran fcurran@peterborough.ca T: (705)742-7777

Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab. Validity of results and interpretation are based on the sample and information as supplied.

F: (705)743-3223 Contact/Location: Frank Curran - CITPET