

Title: Standard Operating Procedure for MAML System		
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1. INTRODUCTION AND SCOPE

This SOP is intended to provide instruction on operation of the Mobile Air Monitoring Laboratory (MAML) as it relates to air quality monitoring operations and the data generated during those operations.

2. PRINCIPLE OF THE METHOD

The SOP is intended for mobile air monitoring operations. The method for each individual analyzer on board the MAML is described in the appropriate SOP.

3. MEASUREMENT RANGE AND SENSITIVITY

The SOP is intended for mobile air monitoring operations. The range and sensitivity for each individual analyzer on board the MAML is described in the appropriate SOP. The set up instructions for each individual analyzer will detail what range is appropriate for mobile operations.

4. EQUIPMENT AND APPARATUS

The analyzers installed in the MAML are standard air quality analyzers that have associated SOP's

5. INTERFERENCES

Refer to the SOP's for the individual analyzers. In addition exhaust from the vehicle or generator engines can provide interferences to the monitoring objective. Precautions to minimize this are given later in this document.

6. PRECISION AND ACCURACY

Precision and accuracy is addressed in the individual SOP's for each analyzer.

7. SITE REQUIREMENTS

The MAML is mobile and can collect ambient data while in motion or stationary. Because of the size of the MAML there are considerations as to where monitoring can take place. Height of the vehicle is a consideration that can not be overlooked. The height of the vehicle is affixed to the dash for quick reference.

Secondary roads are an important consideration for turn around space, Surfaces may be soft and lend MAML to incapacitation. Exercise caution and

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carefully consider options when travelling secondary roads. It is recommended that drivers are trained in recreational vehicle operation.

Overnight parking is necessary in hotel parking facilities. See SOP for properly securing MAML as well as 110 volt single circuit shore power down mode.

Stationary monitoring must be done in safe locations. Areas of high traffic volume, high speed traffic and poor visibility must be avoided. Do not block traffic access point while monitoring in a stationary location. Monitoring while in motion must not interrupt traffic. The orange safety beacons should always be used when monitoring in motion. The orange beacons do not operate without the engine running, therefore cannot be used for visibility when stationary.

8. INSTALLATION REQUIREMENTS

Analyzers are installed in the MAML, secured against movement.

The MAML internal temperature must be maintained within the operational specifications of the analyzers. Heating or air conditioning may be required which would require generators to be in simultaneous use, therefore the operator must understand the power controls and consider the additional fuel consumption (and less available monitoring time if running on natural gas). While parked indoors at MacIntyre Centre the doors and windows of the MAML are to be left open to prevent overheating.

9. OPERATIONAL REQUIREMENTS

General Operation Outline of MAML systems

STEP 1 - 10: Prepare the vehicle and switch over power to generator operations

STEP 11 - 17: Startup MAC and laptop computers and programs

STEP 18 – 22: Perform a zero and span check on analyzers

STEP 23 – 25: Survey operations

STEP 26 – 28: Data handling at the conclusion of survey day including a zero check of the analyzers

STEP 29 – 36: Switch over power back to shore power

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Initial Power Switchover to Generator Power Leaving MacIntyre

1. Check generator oil fill to full mark on dipstick only. Check all other vehicle fluids as well.
2. Check natural gas approx 3000psi max
3. Turn off all items drawing power with the exception of the computer (computer is on UPS), turn power selection switch to “off” position.
4. Disconnect from shore power and place power cord into storage compartment, verify mast is down, close pump cabinet compartment and any other compartment doors that may be open.
5. Start MAML engine and move outside the bay.

Set generator fuel selection switch to appropriate setting (recommend using gasoline when not monitoring). Start generator(s). Generator #1 drivers’ side, the fuel selection switch is in pump cabinet. Generator #2 passenger side switch is in the cargo compartment beside the steps. There is enough natural gas capacity to run one generator for three full (approx 12 hr) monitoring days. If switching fuel source from gasoline to natural gas, the fuel bowl in the generator must be empty of gasoline before switching to other fuel. To do this:

- 5.1. Startup the generator while in gasoline mode (generator control panel is located in stairwell of main door).
- 5.2. Set the fuel selection switch to centre position allow generator to run out of fuel and stall.
- 5.3. Set the fuel selection switch to natural gas position, restart the generator.
6. Set Power Source Selector switch to the generator position desired. Some warm up time for the generator(s) will be required; otherwise the generator(s) may stall when given load).Note: A and B on Power Source Selector panel refers to the electrical circuits Side A powers all monitoring equipment. Side B powers support systems, air conditioner, heaters, fridge, water heater etc.
7. Activate all instrumentation over the course of, at minimum, one minute. Activating all instrumentation immediately when the generator(s) is/are not at normal operating temperature may cause the generator(s) to stall. Remember the Grimm and PAH monitors. Total time from shut-down to startup of all instrumentation should be less than 2 minutes. If the generators(s) stall, de-activate all instrumentation and re-start the generator(s), Re-activate all instrumentation more gradually than the initial attempt, while paying audible attention to generator performance being cautious not

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to apply too much load to the generator(s) too quickly. All pumps and air compressor switches are left on during power switch-over so should restart themselves.

Computer Startup

8. Turn on the TV.
9. Ensure the inverter that powers the computer is 'On' indicated by lit green light on Statpower Remote Switch mounted on desk riser beside computer.
10. Startup MAC computer, to do this push top right button (indicated by a left pointing triangle) on keyboard in slide-out tray
11. Allow MAC computer to completely startup.
12. Start "Boring Clock" program on MAC click & drag the clock to the TV screen
13. Start MAP program labeled "MAP VIII 8.02 981029" in Map Folder
 - 13.1. Open MAML Book Aug98
 - 13.2. Averaging time defaults to 30 seconds, however data is normally sampled at 1 minute intervals to easily merge it with data from the Grimm sampler later.
To change to one minute averaging:
On **Sample** menu,
Select **by Time, each**
1 minute
 - 13.3. On **Sample** menu,
Select **Start Event**
Enter a name for the event and save it in the Shared Folder. Our convention calls for three letters signifying the area, or survey event followed by the date.
e.g. Pra50831 Click **Save**
 - 13.4. Click on **View** menu select **Display Panel**. Drag it to the TV screen by dragging to the right, the top bar of the window showing on the left monitor.
 - 13.5. Click on **View** menu select Graph or list to show information on the main monitor.
 - 13.6. To change Graph view options select **Graph Choices** menu select **Plot vs Time** choose **3 hours**

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Analyzer Operations

14. After the Map program is collecting data, all analyzers should have completed their startup routines. Ensure all converters are up to temperature. Put all analyzers into zero
15. Allow 5-7 minutes of zeroing for at least 3 minutes of stable zero readings. This can be done at the shop or in the field. Vehicle engine should be turned off for the duration of the zero check.
16. Switch all to span mode. Allow for 3 minutes of stable span readings.
 - 16.1. Ensure the span cylinders are open
 - 16.2. Ensure the NO span gas has a positive bypass flow on the rotameter attached to the rear panel of the NH3 converter. Adjust the NO span cylinder pressure to set the bypass flow to approx. mid sale on the rotameter.
17. Put all analyzers to sample. Commence sampling. Close the cylinder valves.

Survey Operations

22. If parking to collect data, face the vehicle into the wind.
23. The wind head is aligned to the front of the vehicle. To display correct wind direction while the MAML is parked, the actual vehicle heading is taken into account.
 - 23.1. To do this select Parked Heading under the Setup menu. Enter the direction the vehicle is facing while stopped e.g. north = 360 south = 180
 - 23.2. The default entry in the **GPS Heading** box in the **Set Vehicle Heading** window is taken from the GPS. This is updated if the MAML travels in a given direction for at least 2 MAML lengths at above 3kph.
 - 23.2.1. If the GPS heading appears correct enter a number at least 1 degree from it in order to manually update the MAML heading correctly
 - 23.2.2. If unable to do this prior to stopping, i.e. turning into a driveway then enter the heading as observed from maps or nearby roadways etc.
 - 23.3. Note the compass display in the upper right corner of the display screen.
 - 23.3.1. The Red line is the GPS heading,

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- 23.3.2. the Black line is the heading as entered in the **GPS heading** box of the **Set Vehicle Heading** window
- 23.3.3. The Blue line is the wind direction.
24. Use the MAML Map Data Log Sheet and Continuation Sheet to record information such as rout taken, location of monitoring, whether observations and other comments.

To end Data Collection at the end of the Event

25. At the end of the sampling day repeat the zero check procedure. Allow 5-7 minutes of zeroing for at least 3 minutes of stable zero readings. This can be done at the shop or in the field. Vehicle should be turned off for the duration of the zero check.
26. On the Map Computer:
- 26.1. In the Map program Select End Event on the Sample menu
 - 26.2. Select Close Event File under the File menu
 - 26.3. Then select Quit under the File menu.
 - 26.4. Once the MAC computer has completely booted up, startup the laptop computer. On the laptop, open the shared folder situated on the desktop. This links directly to the Shared Folder on the Mac. Copy and paste the data file(s) from the Mac to a known location on the laptop for later retrieval with a memory stick.
 - 26.5. Select Shut Down under the Special menu
27. On the Toshiba laptop computer
- 27.1. Click the “End measurement” button on the Numeric values window at the end of sampling or data will not be accessible later.
 - 27.2. Then export the data file that was just saved; Select Export data under the File Menu. Use the default export settings.
 - 27.3. Then quit the program and shut down the computer.

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Power Switchover to Land Power

28. Turn off analyzers and converters, particularly NH₃ converter.
 Note: EcoChem PAS 2000 PAH analyzer and Grimm particulate monitors are turned off when not in use to extend pump life.
29. Shut down the computers (Special Menu on MAC) and monitors if not being used and push the OFF switch for inverter power (black panel on counter riser).
30. Switch Power Source Selector switch to OFF position.
31. Shut off generator(s)
32. Hookup to shore power.
33. Switch Power Source Selector switch to LAND POWER position.
34. Turn on all analyzers and converters. Remember the Grimm and PAH monitors are normally kept off when not in use.
35. Notes if plugging into a standard 15 amp circuit such as at a hotel:
 - 35.1. Plug the 30 amp, 4 prong black power cable into the corresponding receptacle in the power access compartment.
 - 35.2. Ensure that the standard extension cord has its female end plugged into the corresponding socket also in the power access compartment. Then plug the extension cord into shore power. Note many motels turn off their outdoor plugs during summer months.
 - 35.3. Be sure that water heater and air conditioner are off before switching to LAND POWER.
 - 35.4. Only keep the SO₂, NO_x, TRS and H₂S pumps on, switch the rest off.
 - 35.5. Switch all analyzers on but leave HC zero oxidizers, TRS and H₂S converters off.
 - 35.6. Computers can remain off.
 - 35.7. Generator current meter must indicate less than 15 amps before switching to land power.

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Computer Networking Information

MAC Network Identity:

Owner Name: AENV

Owner Password: MAML

Computer Name: MAC

APPLETALK Info:

This MAC: 65280.232

Hardware Add: 00050299EA2E

10. CALIBRATION

Calibration of each analyzer is described in the appropriate individual SOP

11. APPLICABLE DOCUMENTS

For each analyzer on board the MAML refer to the related documents:

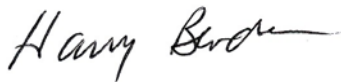
Analyzer operation manuals

Analyzer SOP's

Analyzer SUI's

12. LITERATURE REFERENCES**13. REVISION HISTORY**

Revision 1.1 (January 24, 2011) change power switchover procedure slightly

14. APPROVAL

Approved by: Harry Benders
Title: Air Monitoring Manager

Date: January 24, 2011