

NO DIG *Equipment*

The Trenchless Technology Specialists

VM500

Vacuum Excavation System



**Directional Boring Mud Slurry Clean-Up
Potholing to Locate Buried Utilities
Valve Box, Catch Basin, Manway Cleanout**

Owners Manual

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Important

Read all safety precautions and instructions carefully before operating this equipment. Refer to specific instructions on how to tow, set up, operate and empty the Spoil Tank. The machine must only be operated by an adult person who has both the physical and mental capacity to do so.

Ensure that the machine is shutdown prior to trying to perform any maintenance tasks on it.

Whilst this machine has a wide variety of capacities it is not intended to be used for any of the following purposes: -

- Water blasting or vacuum excavation of any strongly acidic or alkaline solids or liquids;
- Vacuum excavation of materials such as asbestos fibres or other similar hazardous materials;
- Vacuum sucking of any flammable or combustible liquid or solid where the mixture of a high quantity of air may lead to either a combustible or explosive atmosphere;
- Vacuum excavation of "contaminated wastes" such as human or animal effluent, food grease traps etc. as the machine is not designed or licensed to perform such tasks;
- Water blasting of people or animals or water blasting near where people or animals are likely to walk or stand.

Warranty coverage for the machine is in accordance with the Australian Consumer Guarantee under the Competition and Consumer Act 2010 (the "Act"). As such, no warranty cover is provided to damage caused to the machine by operator error or omission or from incorrect towing or vehicular accident. Refer to correct operating instructions detailed in this manual.

With correct operation, maintenance and care, the VM500 Vacuum Excavator is designed for many hours of operating use. If it does not function correctly, please consult the fault finder list for potential causes and remedies. If that fails to resolve the issue, please contact our maintenance department for assistance.

Model No: _____

Serial Number: _____

Purchase Date: ____ / ____ / 20__

Original Purchaser: _____

Safety Precautions – Summary

The following safety precautions must be observed with the VM500 Vacuum Excavator: -

Towing

The towing vehicle must have:-

- A two (2) tonne towing capacity;
- 50mm tow ball.
- Standard trailer electrical connections.

Maximum Towing Speeds: -

- 80 km/hr on sealed roads;
- 60 km/hr on unsealed / rough roads.

Before driving off: -

- Attach safety chains;
- Raise and stow trailer jockey wheel;
- Release handbrake & stow wheel chocks.

Parking & Set-up

When parking and setting up: -

- Do not park on a tilt angle greater than 20 degrees lean angle in any trailer direction;
- Apply the trailer (and if attached, the vehicle) park brake;
- Lower the trailer jockey wheel;
- Install wheel chocks.

Do not park in a situation that will: -

- Cause a traffic hazard;
- Interfere with other workplace machines;
- Be hazardous to pedestrians.

Operating Environment

The **exhaust gases** from the machine engine **are toxic**. Hence: -

- Do not operate in a fully or partially enclosed building such as a warehouse or building basement, unless sufficient fresh air is available

The noise from the operating machine is high, therefore: -

- Do not operate in areas at time where noise restrictions apply.

Operating Water Blaster

Whilst water blasting, do not blast: -

- Any person or animal with the water blast;
- Too close or at an angle to the ground in a manner that produces a lot of blow back.

Do wear: -

- Fully enclosed footwear;
- Long trousers;
- Sealed safety glasses or goggles.

Operating Vacuum Sucker

Whilst vacuuming, Do Not: -

- Bring the end of the suction nozzle into contact with a person's skin;
- Plunge suck into either a liquid or solids as the suction action will stop;
- Collect acidic, alkaline, flammable or combustible materials or controlled waste.

Do: -

- Suck up material dislodged by the water blaster;
- At a maximum, only half cover the end of the suction hose nozzle.

Emptying Storage Tank

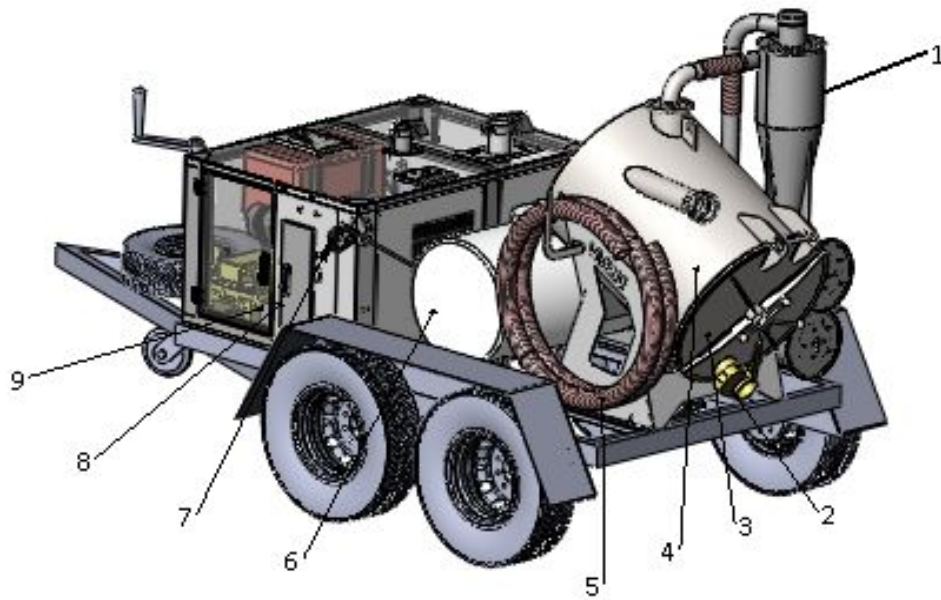
Prepare for storage tank emptying by: -

- Positioning trailer in suitable dump location;
- Drain liquids first by drain valve.

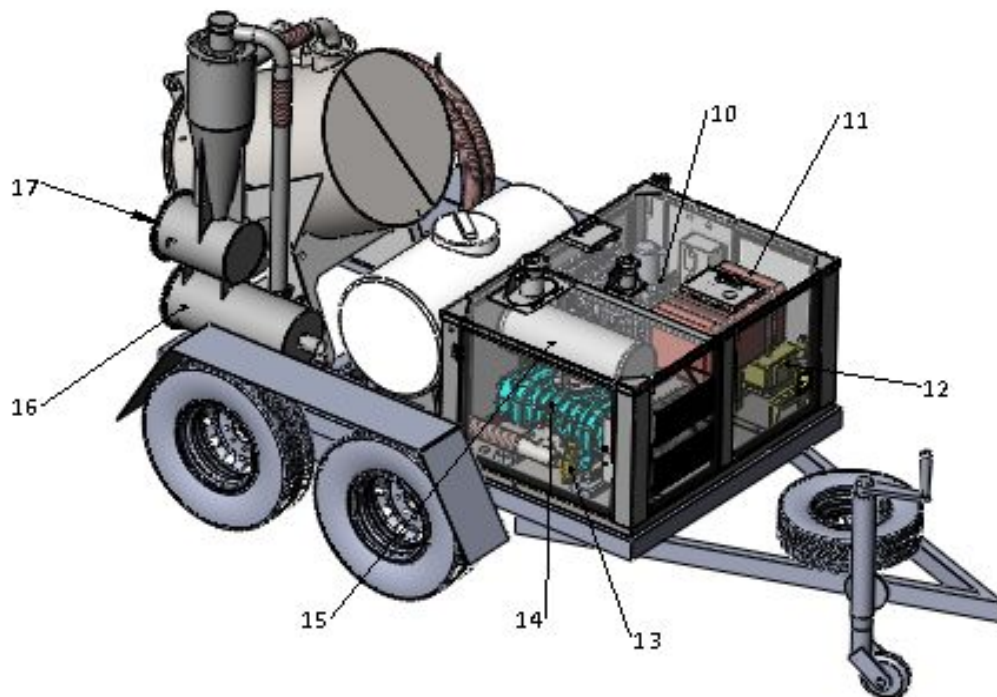
Open the dump door by: -

- Unlocking the door whilst the vacuum pump is still on;
- Stand clear and turn off vacuum pump. Door will swing open by itself.
- Wash out tank with water blaster.

Machine Overview



- | | |
|--------------------|--------------------------|
| 1. Cyclone filter | 10. Kohler diesel engine |
| 2. Drain valve | 11. Fuel tank |
| 3. Vacuum tankdoor | 12. Water pump |
| 4. Vacuum tank | 13. Relief valve |
| 5. Suction hose | 14. Blower |
| 6. Water tank | 15. Silencer |
| 7. Water lance | 16. Filter housing |
| 8. Control panel | 17. Dust collector |
| 9. Battery | |



Operating Principles

The Vacuum Excavator works on the principle of air velocity in order to produce suction at the end of the hose nozzle. Therefore if the end of the suction hose is fully plunged into either a solid or liquid no air flow will occur and there will be no suction.

The vacuum system uses a 3 stage filtration system in order to filter dirt from the air stream. Firstly solid or liquid material is drawn into the air stream at the end of the suction hose and travels to the collection tank. Due to a sudden change in volume in the tank, the air speed dramatically drops and the solid or liquid material falls out of the air stream into the collection tank.

Second filtration is by cyclone to remove any coarse dust particles.

Then the third and final stage removes dust from the airstream via a cartridge type air filter.

Air flow through the whole air circuit is important to ensure that suction is maintained. It is critical not to overload the filters in the air stream circuit. This is best achieved by not sucking dry material into the machine. Therefore always use water to break up the ground to be sucked away by using the in-built water blaster.





The “No-Dig” action of the machine is achieved by firstly wetting, loosening and breaking up tight hard ground with the water blaster and then sucking away the loosened ground with the vacuum hose. The machine is primarily designed as a two person operation where one person is performing the water blasting operation whilst the other is vacuuming away the loosened material.





The primary design intent of the machine is to loosen and suck away ground and small rocks around buried services or in tight work areas.

The machine is not designed or intended to for vacuuming toxic or hazardous material. In case of accidental contact with toxic or hazardous material use appropriate dumping and clean out procedures.


Operating Instructions

Towing the Vacuum Excavator




Task	Step	Key Points
Trailer inspection	1. Complete a trailer inspection using the checklist on the right.	 <p>ACTIVITY</p> <p>Check that the following items on the trailer: -</p> <ul style="list-style-type: none"> • Any obvious damage to the trailer structure. • The tyres are correctly inflated. • The wheel nuts are tight. • The handbrake is operational. • The safety chains are in good order. • All trailer lights are in good condition. • The wheel chocks are available. <p>DANGER!!!</p> <p>Do not tow the trailer if any faults are found.</p> 
Towing vehicle inspection	1. Complete a towing vehicle inspection using the checklist on the right.	 <p>ACTIVITY</p> <p>Check that the following items on the towing vehicle: -</p> <ul style="list-style-type: none"> • Minimum towing capacity of 2T • 50mm tow ball hitch with safety chain connection rings. • Trailer lights connection. • Correct vehicle tow height for the trailer. <p>DANGER!!!</p> <p>Do not tow the trailer with an undersized towing capacity vehicle.</p> 
Connect Trailer to towing vehicle	<ol style="list-style-type: none"> 1. Raise the trailer tow hitch to above the height of the vehicle tow ball. 2. Position tow ball under the trailer tow hitch. 3. Lower the trailer hitch onto the vehicle tow ball. 	<p>Wind the jockey wheel handle in order to raise the trailer hitch to be just slightly higher than the trailer tow ball.</p> <p>Either back the vehicle or move the trailer into the correct position. Be aware that the trailer is very heavy and difficult to move. Apply hand brake on towing vehicle.</p> <p>Wind the jockey wheel handle in order to lower the trailer hitch onto the towing vehicle tow ball. Remember to open the trailer tow ball hitch to allow the ball to fully engage with the hitch.</p> <p>Secure tow ball hitch and lock out.</p>

Task	Step	Key Points
	<p>4. Stow the jockey wheel.</p> <p>5. Connect the safety chains.</p> <p>6. Connect the electrical connections.</p> <p>7. Stow wheel chocks.</p> <p>8. Release the trailer handbrake.</p>	<p>With the trailer correctly connected to the trailer, release the jockey wheel clamp and swing the jockey wheel 90° to ensure it is clear of road.</p> <p>Connect the safety chains on the trailer to the connection links on the towing vehicle tow hitch.</p> <p>Connect the trailer electrical connections to the towing vehicle and check for correct brake light and indicator light operation.</p> <p>Collect the wheel chocks from the ground and stow in brackets on the trailer.</p> <p>Operate the trailer handbrake lever and ensure that the brakes are released.</p> <div style="border: 1px solid red; padding: 5px; margin-top: 10px;">  <p>DANGER!!! Ensure that the reversing arm is returned to open position to enable the trailer brakes to auto operate.</p> </div>
Towing Trailer	<p>1. Test vehicle / trailer brakes.</p> <p>2. Tow at a safe road speed.</p> <p>3. Trailer override brakes will assist in braking the trailer.</p>	<p>If possible on a flat good road surface, test that the towing vehicle can brake and hold the Trailer</p> <div style="border: 1px solid red; padding: 5px; margin-top: 10px;">  <p>DANGER!!! If the towing vehicle is having trouble being able to brake with the load of the Vacuum machine trailer then do not tow further.</p> </div> <div style="border: 1px solid green; padding: 5px; margin-top: 10px;">  <p>NOTE The Vacuum Excavator and trailer have poor aerodynamics and when the drum has contents in it, it has a high centre of gravity.</p> </div> <p>Only tow the VM500 Vacuum Machine trailer at the following maximum speeds: -</p> <ul style="list-style-type: none"> • 80 km/hr on good sealed roads. • 60 km/hr on unsealed or poor condition sealed roads. <p>If strong cross winds or slippery roads, reduce speed to a lower safer speed.</p> <div style="border: 1px solid purple; padding: 5px; margin-top: 10px;">  <p>REMEMBER!!! The trailer is fitted with override brakes that will assist in the overall braking effort but can produce jerks in stop-start traffic.</p> </div>









Parking and Set-Up



Task	Step	Key Points
Positioning the Trailer for operation	1. Position trailer with towing vehicle.	Use the towing vehicle to position the Vacuum Machine in the correct location.
	2. Install override-brake locking latch if reversing.	Prior to reversing the trailer into position it is necessary to swing the reversing lever on the trailer hitch into position to prevent trailer brakes engaging whilst reversing.
	3. Check for reasonably level surface. No greater than 20° lean angle.	Both the engine and the blower have lubricating oil sumps in them. If the trailer is parked at an angle of greater than 20° then oil starvation and equipment damage can occur.
	4. Apply towing vehicle and trailer park brake.	Apply towing vehicle handbrake from inside the vehicle and then apply the trailer hand brake.
	5. Install trailer wheel chocks	Collect trailer wheel chocks from the trailer and position under the trailer wheels in the direction of most likely trailer movement.
	6. Lower jockey wheel.	If detaching the towing vehicle from the trailer, release the jockey wheel bracket, swing down 90°. Wind down jockey wheel until it is touching the ground.
	7. Disconnect the trailer from the towing vehicle if required.	The Vacuum Machine trailer can remain attached to the towing vehicle or detached if required.
		 <p>ACTIVITY</p> <p>If you wish to detach the towing vehicle then: -</p> <ul style="list-style-type: none"> • Disconnect the electrical connection. • Disconnect the safety chains. • Release tow ball on trailer tow hitch. • Wind up jockey wheel until the tow hitch clears the tow ball. • Drive towing vehicle away.




Operating Environment






Task	Step	Key Points
<p>Check for adequate fresh air in operational area.</p>	<p>1. Check that the operating area has adequate fresh air.</p> <div style="text-align: center;">  <p>Note: The engine exhaust gases are toxic.</p> </div>	<div style="border-left: 2px solid red; padding-left: 5px;">  <p>DANGER!!! DO NOT operate the Vacuum Machine in an enclosed or mostly enclosed building, tank or underground basement without providing adequate fresh air to the operator's position.</p> </div> <div style="border-left: 2px solid green; padding-left: 5px;">  <p>ACTIVITY If used in an operating area where fan forced fresh air is provided to the operator's, ensure that they also wear a gas monitor for: -</p> <ul style="list-style-type: none"> • High levels of Carbon Monoxide and Carbon Dioxide; • Low levels of Oxygen. </div>
<p>Operating Noise</p>	<p>1. Both the engine and blower make loud industrial noise.</p>	<p>Consider the impact of the operating noise of the Vacuum Machine if used in an area near residential, office or shopping areas.</p> <p>Also some planned work locations may have night time noise restrictions.</p>

Operating Vacuum Excavator



Task	Step	Key Points
Perform pre-start check.	1. Perform pre-start check of the trailer engine and blower.	 <p>ACTIVITY Complete the Engine and Blower pre-start check list section of the Vacuum Excavator</p>
Lay out suction hose.	1. Set up the suction hose and connect to the collection drum.	<p>Unroll the suction hose from the machine and lay it out on the ground. Ensure that it is not forced around tight corners that will damage the hose.</p> <p>Attach the suction hose to the collection drum using the Camlock fittings.</p>  <p>REMEMBER!!! The suction hose is heavy duty and heavy to lift. Best performed as a two person operation.</p>
Start the engine.	1. Start the engine in order to provide power to drive the blower.	 <p>ACTIVITY Start the trailer engine by: -</p> <ul style="list-style-type: none"> • Turn the battery isolator on. • Rotate Emergency Stop to off (out) position • Check for adequate fuel and turn fuel lever to half. • If petrol engine set the choke if the engine is cold. • Turn and hold the ignition key in the “on” position until the engine starts. Let go of the key. • If the engine is cold, allow it to warm up for several minutes. • When the engine is warm, bring the operating speed up to full speed.
Vacuum Excavation	<p>1. Wear correct Personal Protective Equipment (PPE).</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p>2. Two Person operation</p>	<p>The combined operation of water blasting and vacuum excavation can generate blow back of high velocity particles.</p> <p>The operator and persons nearby shall wear: -</p> <ul style="list-style-type: none"> • Face shield; • Ear plugs or muffs; • Industrial clothing or overalls; • Closed in footwear.  <p>NOTE The removal of ground material using the Vacuum Excavator is best performed as a two person team.</p> <p>One person operates the water blaster, whilst the other the vacuum hose / nozzle.</p>

Task	Step	Key Points
	3. Initial ground breaking.	<p>First operate the water blaster from a distance to wet the ground or completely wet it with a garden hose. This will minimise dust generation.</p> <p>As the ground becomes wetter, bring the water blaster nozzle closer to the ground surface, but not too close to cause extensive splash back.</p> <p>When loose ground is produced by the water blaster, vacuum it away with the vacuum hose nozzle with a maximum of 50% of the nozzle in the material.</p> <p>DO NOT plunge the nozzle completely into the ground as this will result in loss of vacuum and thus no material removal.</p>
	4. Working the exposed face.	 <p>REMEMBER!!! DO NOT suck dry dusty ground material, otherwise the machine dust filters will become clogged resulting in reduced or no suction.</p> <p>When the initial section of material has been removed, it will form an edge. It is best for the water blaster operator to blast and break away the exposed edge whilst the vacuum hose operator sucks away the loosened material.</p>
Reduced suction	1. Operator notices reduced or no suction.	 <p>ACTIVITY</p> <p>If reduced suction is noticed, check the following: -</p> <ul style="list-style-type: none"> • Suction nozzle is completely covered. Remove whatever is covering the nozzle. DO NOT plunge the complete nozzle in solids or liquids. • Blocked suction hose. A large object may have lodged in the suction hose and a blockage has built up around it. Shut down the engine, remove the suction hose and remove blockage. • Engine speed has dropped or stopped. Check if the engine has run out of fuel. • Full collection drum. Empty the drum. • Blocked filter. Shut down the machine, remove and clean the filter. • Added length of suction hose. Reduce suction hose length to standard supplied length.

Task	Step	Key Points
Shutting down the Vacuum Excavator	<ol style="list-style-type: none"> 1. Shut down water blaster. 2. Empty the suction line. 3. Shut down engine. (Leave it on if material discharge is going to occur at current work location) 	<p>Switch off the water pump on the control panel in order to stop the water blaster.</p> <p>Lay the suction hose down with the nozzle completely open to allow any material in the suction hose to be sucked into the collection drum.</p> <p>Lower the engine speed to idle. After 10 seconds at idle, turn the ignition key to the off position.</p>
Emptying the storage drum	<ol style="list-style-type: none"> 1. Choose the discharge location. 2. Decide on liquid or solid material release. 	<p>The material storage drum can be emptied at the work location or towed to a different location.</p> <div style="border: 1px solid black; padding: 2px; width: fit-content;">  <p>Note</p> </div> <p>NOTE If the trailer is going to be towed to a different location for emptying, always following the towing instructions detailed earlier in this manual. Also stow water blasting and suction hoses as detailed below.</p> <p>Dependent on what has been sucked into the storage drum; choose a liquid release instead of a solid release.</p>
	<ol style="list-style-type: none"> 3. Mainly or initial LIQUID release. 	<div style="border: 1px solid black; padding: 2px; width: fit-content;">  </div> <p>ACTIVITY If mainly or initially a LIQUID release then:-</p> <ul style="list-style-type: none"> • Return the engine to idle and switch off. • Move to the rear of the collection drum and slowly open the gate valve and allow the liquid to drain.
	<ol style="list-style-type: none"> 4. Mainly SOLID material release. 	<div style="border: 1px solid black; padding: 2px; width: fit-content;">  </div> <p>ACTIVITY If mainly SOLID material release:</p> <ul style="list-style-type: none"> • Ensure that the engine is at full speed in order to achieve full suction. • Move to the rear of the collection drum and unscrew the central door handle until it is completely released. As long as suction is being maintained, the door will remain closed. • Whilst no person is standing in front of the door, return to the engine, reduce the speed to idle then switch it off. • The drum door should open by itself and the solid material should discharge.



Task	Step	Key Points
	<p>5. Washing inside of the collection drum.</p> <p>6. Leave collection drum door open to allow drum to dry out.</p>	<p>Use the water blaster to wash out any remaining material.</p> <div>  <p><i>Note</i></p> </div> <div> <p>NOTE Do not water blast the rubber seal at the end of the drum, otherwise the seal can become damaged and prevent correct vacuum seal for the next operation.</p> </div> <div>  </div> <div> <p>DANGER!!! Do not enter the inside of the collection drum without following correct Confined Space entry procedures.</p> </div> <p>If desired the drum door can be left open to allow it to dry out.</p> <div>  </div> <div> <p>DANGER!!! Ensure that no member of the public can access the open drum.</p> </div>
<p>Closing the drum door</p>	<p>1. Correct body position</p> <p>2. Push the door shut.</p> <p>3. Fully close the door with the locking screw.</p>	<p>The drum door is best closed by standing directly behind the middle of the door.</p> <p>Using one foot lodged in the discharge of the discharge valve, push the door shut and engage the door locking handle.</p> <div>  </div> <div> <p>DANGER!!! Be aware of the pinch point area between the door and the drum. Keep all hands and fingers clear of this area.</p> </div> <p>When the locking screw is engaged, the door can be fully closed by winding the locking handle in until it is tight.</p>
<p>Packing up hosing.</p>	<p>1. Disconnect and pack away suction hose.</p> <p>2. Disconnect and pack away water blaster.</p>	<p>Disconnect the suction nozzle from the suction hose and stow it</p> <p>The suction hose can remain connected to the tank and coil up hose on the provided hook.</p> <div>  </div> <div> <p>REMEMBER!!! The suction hose is heavy duty and heavy to lift. Best performed as a two person operation.</p> </div> <p>Disconnect the water blaster gun from the hose and stow it.</p> <p>Wind up the water blaster hose onto the hose holding area.</p>

Operating Water Blaster

Task	Step	Key Points
Perform a pre-start check.	1. Perform pre-start check of the water blaster.	 <p>ACTIVITY Complete the Water Blaster pre-start check list section of the Vacuum Excavator</p>
Lay out pressure hose and attach water gun	1. Set up water pressure hose and gun.	<p>Uncoil water pressure hose from the machine and lay it out on the ground. Ensure that no kinks are made in the hose.</p> <p>Attach the water gun to the end of the hose using the quick connect fittings.</p>
Start the engine.	1. Start the engine in order to provide power to drive the high pressure water pump.	Start the trailer engine as detailed in the "Vacuum Excavation" operating instructions. Allow the engine to warm up. Bring engine speed up to full.
Water Blasting	<p>1. Wear correct Personal Protective Equipment (PPE).</p> <p>2. Engage the water pump via the control panel.</p> <p>3. Operate the trigger on the water gun.</p> <p>4. Water blast at the correct angle to exposed face.</p>	<p>The operation of water blasting can generate blow back of high velocity particles.</p> <p>The operator & persons nearby shall wear: -</p> <ul style="list-style-type: none"> • Face shield • Ear plugs or muffs • Industrial clothing or overalls • Closed in footwear <p>Engage the water pump by switching the electric clutch to the "On" position on the control panel.</p> <p>Operate the trigger on the water gun to commence blasting operations.</p> <p>The water blasting action will work best if performed at a slight angle from the vertical and "biting" away slowly from the exposed face.</p>
	<p>5. DO NOT water blast people or animals.</p> <p>6. Do not run water pump dry.</p> <p>7. Shut down water pump when water blasting has been completed.</p>	 <p>DANGER!!! Water blasting can cause injury to persons. DO NOT water blast any part of a person's body or use it to wash.</p> <p>Always ensure that there is adequate water in the water tank prior to operation of the water blaster. Damage will occur to the water pump if it is run dry.</p> <p>If no further water blasting is going to occur for a period of time, shut down the water pump by switching the electric clutch to the "Off" position.</p> <p>Damage will occur to the water pump if no flow occurs for an extended period of time.</p>

Task	Step	Key Points
<p>Completed Water Blasting</p>	<ol style="list-style-type: none"> 1. Switch off water pump. 2. Disconnect water Lance 3. Stow water blasting hose. 	<p>When water blasting has been completed, switch water pump to the "Off" position.</p> <p>Disconnect the water blasting gun from the hose using the quick connect coupling.</p> <p>Stow water blasting gun on trailer.</p> <p>Wind up and stow the water blasting hose on the trailer. Ensure the hose is not kinked whilst stowing it.</p>

End of Day (Shift) Servicing of the Vacuum Machine

Task	Step	Key Points
End of day (shift) servicing.	1. Shutdown and if required isolate the engine, using battery isolator.	 <p>DANGER!!! The machine drive engine must be shut down. If required by your worksite, switch off battery isolator and lock it out prior to performing any servicing tasks.</p>
	2. Clean the blower pre-filters	<p>The blower is protected by a cyclone pre-filter and final cartridge filter.</p>
	3. Cleaning cyclone filter.	<p>Remove the cover door & place to one side. The chamber may have some collected dust. Sweep the dust out with a brush. If this chamber has a lot of dust in it, the suction work has been performed “too dry”. Next time use more water. Replace the cover door.</p>
	4. Cleaning filter cartridge.	<p>Remove cover door & place to one side. Remove the cartridge filter and at a separate location either blow it clean with compressed air (max pressure 100 kPa) or wash it with a garden hose. Do not use the water blaster. If washed allow the filter to dry before reinstalling.</p>
		 <p>NOTE DO NOT bang filter cartridge on ground to clean it, as it will damage the filter and potentially cause damage to the blower.</p>
	5. Reinstall filter cartridge.	<p>When the filter cartridge is clean and dry, reinstall into the chamber and replace the cover door.</p>
	6. Refill the water tank.	<p>For most work tasks the water tank has sufficient quantity of water to last one waste tank fill. Refill the tank with water as required. Only use clean water to fill the tank and do not add any detergents etc. Check and if necessary clean the water filter.</p>
	7. Refill engine fuel tank.	<p>For most work tasks the fuel tank has enough fuel to last one day or shift. Refill the fuel tank with the correct fuel at the end of the working day.</p>
8. Conduct a general condition check.	<p>Conduct a general condition check of the machine looking for oil leaks, damaged hoses, flat tyres etc.</p>	

Trouble Shooting Guide

If your Vacuum Machine fails to function correctly, refer to the following table for potential issues and solutions.

Symptom	Cause	Solution
1. Engine does not turn over.	<ul style="list-style-type: none"> a) Low or dead battery b) Corroded or bad connections c) Faulty ignition switch d) Faulty starter motor e) Seized blower 	<ul style="list-style-type: none"> a) Charge or replace battery b) Clean or replace connections c) Replace ignition switch d) Replace starter motor e) Clean out or replace blower.
2. Engine does not start	<ul style="list-style-type: none"> a) Emergency Stop pressed in b) Battery Isolator c) Empty fuel tank d) Fuel line disconnected e) Dirty fuel filter f) Faulty fuel pump g) Faulty spark / glow plugs h) Faulty ignition coil 	<ul style="list-style-type: none"> a) Release Emergency Stop b) Open Battery Isolator switch c) Refill fuel tank d) Connect fuel line e) Replace fuel filter f) Replace fuel pump g) Replace spark / glow plugs h) Replace ignition coil
3. Engine lugs or stalls	<ul style="list-style-type: none"> a) Empty fuel tank b) Engine speed too low c) Vacuum relief blocked or set too high d) Air filter blocked 	<ul style="list-style-type: none"> a) Refill fuel tank b) Increase engine speed to 3600 RPM c) Clean relief area or readjust relief setting d) Clean or replace air filter
4. No water pressure	<ul style="list-style-type: none"> a) Water pump not switched on b) Water tank empty c) Water filter blocked d) Water nozzle blocked e) Air in water system f) Water pump not turning g) Blocked water supply hose h) Faulty water pump 	<ul style="list-style-type: none"> a) Switch on water pump b) Refill water tank c) Clean or replace water filter d) Clean or replace nozzle e) See #8 below f) See # 7 below g) Clean or replace hose h) Replace water pump
5. Low water pressure	<ul style="list-style-type: none"> a) Water filter partially blocked b) Air in the water system c) Leak in the water system d) Water pump turning too slow e) Incorrect nozzle size or worn out nozzle 	<ul style="list-style-type: none"> a) Clean or replace water filter b) See #8 below c) Repair leak d) See #7 below e) Replace with correct or new nozzle
6. Water pressure fluctuates up and down	<ul style="list-style-type: none"> a) Air in the water system b) Leak in the water system c) Water filter partially blocked 	<ul style="list-style-type: none"> a) See #8 below b) Repair leak c) Clean or replace water filter
7. Water pump not turning or turning too slowly	<ul style="list-style-type: none"> a) Engine speed too low b) Water pump frozen c) Faulty water pump 	<ul style="list-style-type: none"> a) Increase engine speed to 3600 RPM b) Thaw out pump c) Replace water pump
8. Air in water system	<ul style="list-style-type: none"> a) Cracked filter housing b) Loose fitting(s) 	<ul style="list-style-type: none"> a) Replace filter housing b) Tighten fittings

For further assistance, please call No Dig Equipment Service Department on **(08) 9493 0642**.

Our technician will be pleased to assist you with your questions

Determining Tank Fill Level

Note: applicable to trailer units only.

The VM500 is designed as a potholing machine and its general operation is suck and dump. It can be used to cart spoil but caution must be exercised to ensure the trailer is not overloaded. Use the reference chart below to help determine how full of various materials the vacuum tank can be without overloading the trailer.

Exceeding the maximum fill level will overload the trailer.

To use this chart, first find the material being excavated, if the material being excavated is not listed, select material with similar density. Then determine the maximum fill level.

Material	Maximum Vacuum Tank Fill Level
Wood Chip	100%
Leaf / grass waste	100%
Water	100%
Drill Mud high water contents	100%
Sand	100%
Earth loose	100%
Limestone	100%
Asphalt	100%
Granite / Road Base	100%
Pindan / Iron Ore based mud	100%
Gravel	100%
Shale, rip rap.	100%

Daily (Shift) Pre-Start Checklist

The following two page checklist should be used at the start of each working day (shift) relevant to the area(s) of the Vacuum Machine that will be used during the working day. A relevant section of the checklist may be filled out prior to the area of the machine being used.

Vacuum Machine Location _____ Date: _____

Pre-Start - Towing

#	Pre-Start Check Requirement	Initials
1	Check general condition of the trailer – no damage or protruding items – drum door closed.	
2	Check tyres are correctly inflated and no visual damage to them.	
3	Check wheel nut tightness – Tight turning the heavy trailer can cause the wheel nuts to loosen.	
4	Check that the towing vehicle has a minimum of two (2) tonne towing capacity.	
5	Check that towing vehicle has a standard diameter 50mm tow ball.	
6	Connect trailer to vehicle – Check safety chains are secured and electrical connections made.	
7	Check for correct operation of all trailer lights.	
8	With vehicle handbrake applied, check that trailer handbrake is released & revering link removed.	
9	Stow jockey wheel and wheel chocks correctly.	

Pre-Start - Operational Set-Up

#	Pre-Start Check Requirement	Initials
1	Check that trailer handbrake is applied and wheel chocks installed.	
2	Ensure that trailer operation angle does not exceed 20 degrees in any direction.	
3	Check that the operational environment is not in an enclosed or partially enclosed building.	
4	Plan where the removed material will be dumped.	
5	Check that the planned material to be removed is not acidic, caustic, combustible, flammable, toxic or hazardous material such as asbestos etc.	

Pre-Start - Water Blaster

#	Pre-Start Check Requirement	Initials
1	Check that the water tank has sufficient water in it.	
2	Check for correct oil level on the water pump – look at sight glass.	
3	Check the condition of the water pressure hose – no damage or kinks	
4	Check the condition of the water blaster wand & nozzle. Do not inspect whilst connected to hose.	
5	Check that the quick connect functions correctly.	
6	Visual checks for water leaks in hoses from water tank to pump.	
7	Clean water filter if required.	
8	Operator is competent to use the water blaster.	

Pre-Start – Vacuum Excavation

#	Pre-Start Check Requirement	Initials
1	Check that the cartridge filter is correctly installed. Severe blower damage can occur if not fitted.	
2	Check that the collection drum door is correctly closed.	
3	Check that the collection drum door valve is closed.	
4	Check that the blower has correct oil level – Refer to sight glass on blower.	
5	Check that the engine has sufficient engine oil. – Use dip stick.	
6	Check that the fuel tank has sufficient fuel and fuel type.	
7	Check condition of suction hose, nozzle and cam lock.	
8	Determine if noise restricted area during certain times of the day.	
9	Operator has sufficient physical strength to hold the suction hose and nozzle.	
10	Operator is competent to use the vacuum excavating machine.	

Pre-Start – Collection Drum Emptying

#	Pre-Start Check Requirement	Initials
1	Check that dump location is suitable for material release.	
2	Determine if liquid or solid material release or liquid first Refer to operating instructions.	
3	Check that the drum door will be able to swing open when the vacuum is turned off.	
4	Do not blast rubber door seal when washing out the inside of the collection drum.	
5	Do not enter the collection drum without a Confined Space permit.	
6	Operator or two person team have sufficient physical strength to close the collection drum door.	

Operational Risk Assessment

A number of Occupational, Workplace Health and Safety and Mining Safety Acts or Regulations require an operational risk assessment to be supplied by the equipment provider to the end user.

Detailed on the following pages is an operational risk assessment for the towing, set up, operational use and cleaning of the Vacuum Excavator including water blasting and vacuum excavating. The risk assessment is strictly operational and as such does not include any non-operational maintenance tasks that may need to be performed on the machine from time to time. For example, engine oil change etc.

The Risk Assessment assumes that the operator will become competent in the operation of the machine via reading and following the operating instructions detailed in this Operating Manual. Any deviation from the operational instructions or misuse of the machine either deliberately or inadvertently will potentially leave the operator or nearby persons at risk of injury or harm to their health.

It is essential that the operating person(s) need to have both the physical strength and mental capacity to safely operate the machine. As such, the machine shall only be operated by adult persons who have the required capacities.

Furthermore, it is essential that the vacuum system does not remove any material that due to the combination of the large quantity of air could lead to the creation of either an explosive or flammable environment in the collection drum.

It is also essential that all operators review this risk assessment and use it as a basis of performing their own “on the job” hazard assessment and control as required by relevant occupational, workplace or mining operations health and safety laws.