

JOYCE EMERGENCY PLANNING AND PREPERATION (JEPP) MOBILE EMERGENCY WATER SUPPLY PROJECT

By Terry Barnett and Jim Buck

In July of 2016 a committee from JEPP was charged with exploring the possibility of creating or purchasing a mobile water filtering system that would eventually sustain 300 people for 3 weeks with purified drinking and cooking/cleaning water. Survival guidelines suggest about 1.1 gallons of water per person per day are needed, however in order to cook and sanitize food preparation equipment more is needed. We proceeded with the assumption that about 1.5 gallons per day would be sufficient to support our needs. That would equate to approximately 450-500 gallons per day needed, plus additional sanitation needs.

We researched numerous products and companies that provide filtration systems that would support our needs. We found it would be cost prohibitive (approx \$10,000) to purchase a system, so we set out to build our own for test purposes to see if a smaller version was viable to use for our project.

In all of our other categories of support for our emergency shelter, we have decided to gather and store products and equipment in increments to better our ability to acquire them (bite off a little at a time), so our goal with our first version of the water trailer was to support 100 people, meaning about 150-200 gallons per day, plus additional sanitation needs.

Some assumptions needed to be made to begin the project. Our Volunteer Fire Department has committed to providing pumping equipment to fill our reservoir containers (275 gallon totes) with pond or stream water, whichever would be available after an earthquake or other emergency situation. This would cut down the time it would take to fill/chlorinate/flocculate/sediment settle the holding water.

For the purposes for our test trailer we pumped water into the holding tote with a 12 volt transfer pump that will do approx 200 gallons per hour. (We used this pump as it would be a viable option if no electricity was available) so to fill the tote to the usable 275 gallon line it would take about 1 ¼ hours to fill. Poolife 78% TURBOSHOCK calcium hypochlorite is SPECIFIED FOR THIS APPLICATION. Other products may contain harmful fillers. Different percentage products will require a recalculation of the correct amount of chlorine to apply to the water. This additive needs to be in the tank about 1 hour (contact time) to ensure bacteria kill and aid in settlement of sediment.

Our test trailer is equipped with a Gusher Titan 16 gpm manual bilge pump with 1 1/2" inlet (suction side) and outlet. This then pushes the pretreated water through three 4.5"x20" filters with 1" inlet & outlets. The filters are 10 micron, NSF/ANSI 53 or 58 1 micron (SPECIFIED) and then Carbon Block. We then pump the filtered water to two 55 gallon food grade plastic treated drums for distribution.

In real world testing we have been able to maintain a 6 gallons per minute flow rate into the storage containers with moderate physical activity. This would allow us to empty the holding container in approx 40-45 minutes (only 250 gallons usable due to settlement). With the time to fill, treat, pump & filter 250 gallons would be about 3 hours. This would support our 100 people per day. The addition of a second treatment tote would double the system production by having chlorinated water available to pump through the filters all the time.

This system was constructed using readily available parts and pieces and was designed with simplicity and the ability to be taken apart and repaired easily. It is very mobile.

JOYCE EMERGENCY PLANNING & PREPARATION

MOBILE EMERGENCY WATER SUPPLY TRAILER

Bill of Materials

4X8 Utility Trailer repairs to trailer	Donated value	\$250.00 approx.
275 Gallon Tote	Donated value	\$270.00
2 ea 55gallon plastic barrels	Donated value	\$100.00
1 ea Gusher Titan BP4402 Bilge Pump purchased online Go2marine		\$118.50
1 ea Intake strainer with check valve		\$ 27.50
1 ea Triple Big Blue 4.5x20 filter housing & bracket online USA Water Supply #222170393268		\$145.00
4 ea 10micron Big Blue sediment filter #321756118109 ebay spring oasis		\$64.00
4 ea 1micron NSF/ANSI 53 or 58 filters (APPROX)		\$47.00
2 ea Carbon Block Big Blue 1micron filter #322010928711		\$48.00
9' 1 ½" pool skimmer water hose(suction side) Home Depot		\$23.49
10' 1" clear vinyl tubing (discharge side) Home Depot		\$46.80

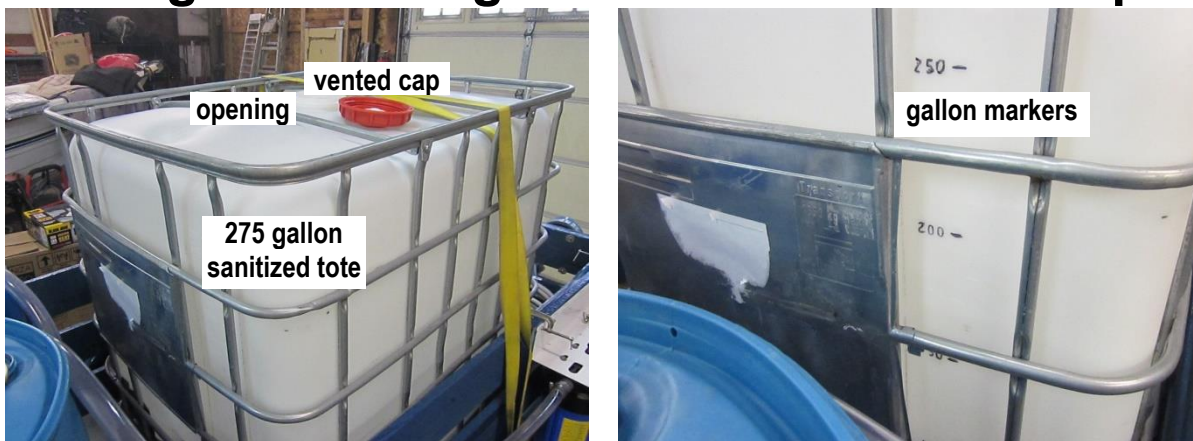
Misc. hose fittings, clamps, drain cocks, drain hose, bolts, nuts, etc.

Local suppliers

\$187.47

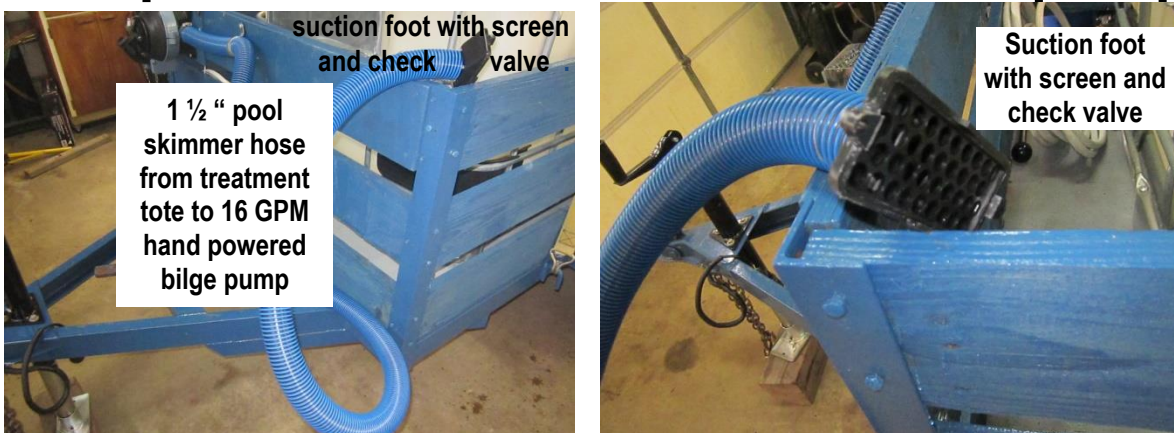
- Notes:
- a. Suction hose should be placed above sediment level in tank when pumping
 - b. Outlet hose will be 1" adapted to 1 1/2" by soaking vinyl tubing in very hot water.
 - c. Use clear tubing(hose) on discharge side to view flow rate and to insure it is dry and clean.
 - d. Secure filters to trailer or remove for travel.
 - e. 1 micron filters must be NSF/ANSI 53 or 58 Standard

275 gallon food grade tote with vented cap



Raw water is treated with calcium hypochlorite and allowed to stand for 30 minutes.

1 1/2" pool skimmer hose from tote to pump



Chlorinated water is drawn from the tote through the suction foot/check valve via a 1 1/2" pool skimmer hose by a 16 GPM hand powered bilge pump. The large diameter skimmer hose provides additional volume to the pump.

16 GPM hand powered bilge pump



System uses a Gusher Titan BP4402 hand powered bilge pump for operation when electrical power is down. System can be upgraded for electrical pumps when power and pumps become available.

Inlet/outlet fittings for hand pump

1" clear vinyl hose
thru 90 elbow to
filter housing with
stainless clamps



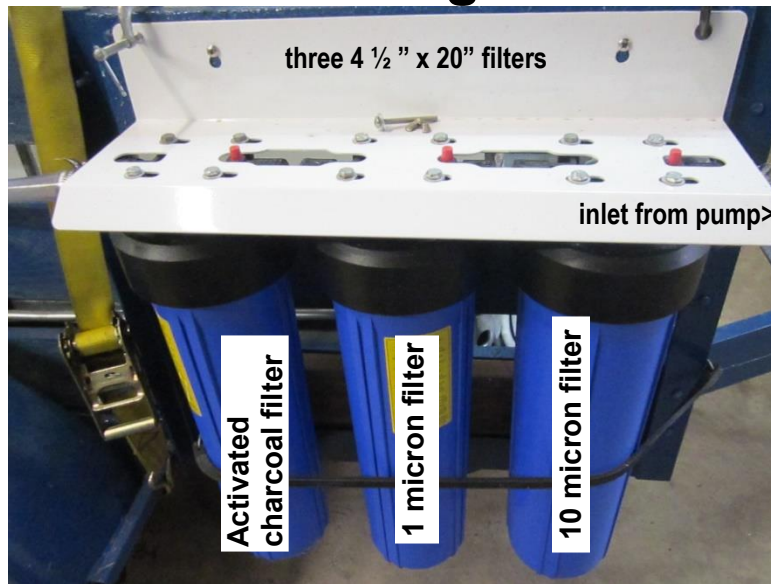
1 1/2" skimmer hose
fastened to pump with
stainless steel clamps



Outlet coupling 1 1/2" reduces clear vinyl
tube to 1" with stainless steel clamps

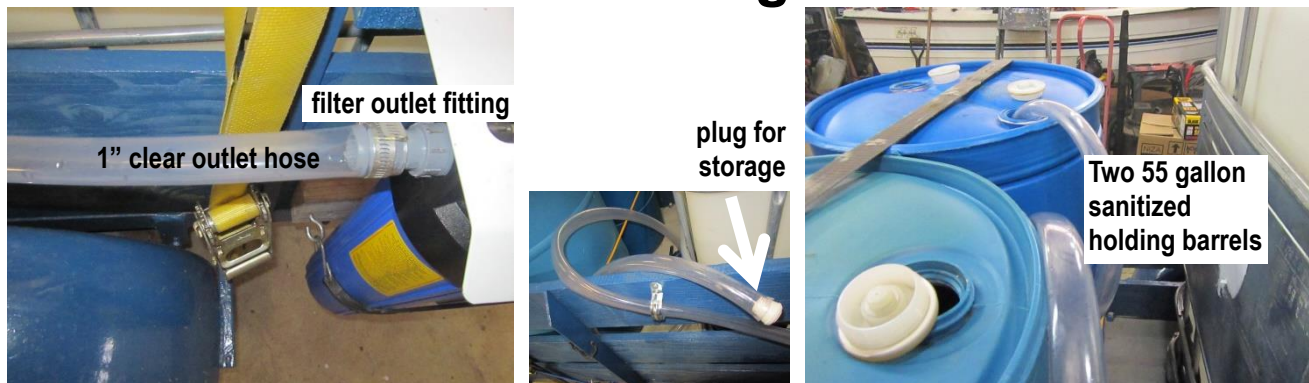
Hoses are reduced from 1 1/2" on inlet side to 1" on outlet to increase pressure through the filters.

Filter arrangement



System uses a Triple Big Blue filter housing and bracket (4.5"x20" filter canisters) to improve flow and prolong filter life. The filters are mounted on the passenger side of the trailer to avoid road spray. Each canister is fitted with drain cocks so canisters can be drained before opening. Canisters should be empty for travel. The bungee cord holds the housings against a 2"x6" to prevent vibration during travel. Filters are Big Blue 10 micron, 1 micron FSI/ANSI 53 or 58 standard and carbon block filters.

Filter outlet and storage/distribution



System uses standard PVC fittings and 10 feet of 1" clear outlet hose to convey treated water from the filters to the storage distribution reservoirs. Storage for this unit is 2 each 55 gallon food grade barrels with standard hose bibs.

10 micron filter condition after 120 gallons



1 micron filter condition after 120 gallons (must meet NSF/ANSI 53 or 58 standard).

