

# SOLAR-DRIVEN WATER TREATMENT SYSTEM FOR DUGOUT WATER

GROUP #7

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## OBJECTIVE

- Model an environmentally friendly mobile treatment system to clean agricultural pond water.
- Provide the option to users of diverting water through a UV disinfection cylinder to be used for human consumption.
- Eliminate raw water constituents of concern, thereby improving accelerated growth rate, health, and quality yield of livestock throughout Saskatchewan.

## BENEFITS

- IMPROVED LIVESTOCK HEALTH**  
Better yields upwards of 23% weight gain in yearling cattle due to improved quality dugout drinking water.  
Improved herd health and accelerated growth. Reduction of risk health outcomes due to consumption of dugout raw bacterial-laden water intake.
- INCREASED PRICE/ANIMAL WITH INCREASED WEIGHT**  
Reaching up to an additional 113.4 kg with treated water. Cattle profit has the ability to increase depending on CWT provincial prices. True for all livestock as well.
- IMPROVED DAIRY MILK PRODUCTION**  
Consumption rate of 68 to 151 litres of water per dairy cow, investing in clean water will provide dairy farmers with increased milk production  
Cows with calves have the ability to produce more milk for their offspring to feed from, increasing calf weight early on.
- BENEFITS TO ENVIRONMENT**  
Improved natural ecosystem for various wild animals such as migratory birds, coyotes, deer, reptiles and fish.  
Opportunity for an alternative human water source with the addition of a UV Disinfection cylinder installed on each unit.

INFLUENT FROM DUGOUT

### SCREEN

A combination of a bar screen and a mesh screen enclosed in a steel pipe is used to remove most suspended solids from the influent stream. Removes any large rocks, tree branches, leaves, fecal matter, and/or algae films from water

### ADSORPTION

The system includes a fixed-bed of granular activated carbon running downflow. Removes solids, organic compounds, residual inorganic constituents, volatile organic compounds and some protozoan cysts and oocysts

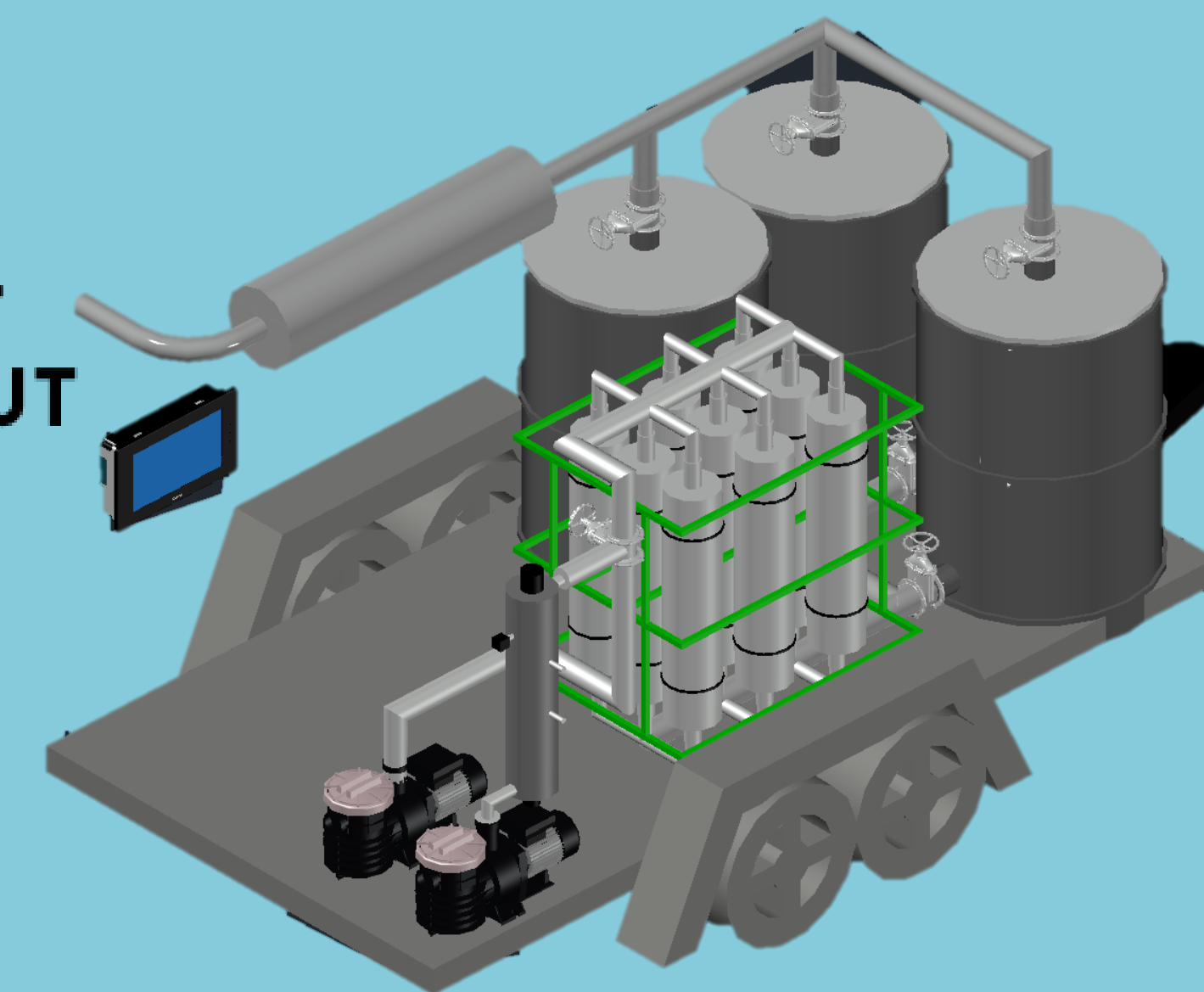
### ULTRAFILTRATION

Total Tubular Membrane area of 2.44 m<sup>2</sup>/rack. All 3 Racks have 3 modules. A third single rack is for redundancy. Theoretical removal efficiency was at 99% and 0.222 for biological and N.T.U constituents respectively

### UV DISINFECTION

40mJ/cm<sup>2</sup> of UV energy capable of treating to the effluent standard below 2.2 MPN/100 mL of chlorine resistant parasites. Treats 5 cubic metres of water per hour to disinfect incoming cryptosporidium and giardia parasites.

EFFLUENT TO DUGOUT



DESIGN

EFFLUENT TO HOUSEHOLD

## CONCLUSION

- The solar-powered mobile treatment system which was designed to improve the quality of dugout water was achieved using wastewater treatment applications.
- Utilizing a process train consisting of a screen, carbon adsorption, ultrafiltration, and UV disinfection, contaminants such as sulfates, bacteria, cryptosporidium, and nitrates can be reduced and water can be discharged as clean effluent.
- Benefits of this design include cattle weight gain, increased milk production, increased ranch capital, healthier livestock herds, and improved water source for natural flora and fauna.
- Until a working physical model is built and actual pilot studies are done, this proposed design is strictly based on theoretical findings and data. Further experimentation is required before marketing this proposed model.

