Appendix A

Research into Mule Replacement.

The Alkè ATX 480 4x4 is the strongest fit for the specified requirements as it can be spec'ed with a larger load platform, avoiding the need to replace the current bowser. It is physically larger than the more typical Mule/Gator platform, but this allows it to achieve a broad specification.

As said it can fit the current water bowser, but also:

- appears to have the correct type approval for legal road use
- maximum load capacity of 1,450Kg (total weight of anything added to the vehicle including equipment, people, accessories etc)
- Capable of towing up to 5 tonnes (on private land, road use will be different, likely meaning a maximum vehicle weight of 3.5 tonnes but ask the supplier)
- Says it's capable of climbing 40% gradients (not clear with what load it can do this but that's an extreme slope)
- Good suspension arrangement, and 2 electric motors (more traction on bad surfaces/rough terrain)
- It can be spec'ed with a fairly large EV battery too, which will provide more range and more pump running time. The downside is longer charging to full battery, more weight, reduced maximum load capacity as the battery takes up some extra capacity.
- Maximum cargo bed size available: 150 x 200 cm
- 12v supply for equipment

link to product page:
https://www.alke.com/off-road-electric-vehicles-atx480

The alternative, more typical ATV platform, would be the Polaris ranger XP Kinetic. This, however, has a smaller cargo bed and has no options sufficient to fit the current bowser.
Key bits included:

- Can b spec'ed with a larger battery than the Alké for even more range and pump power use 29.8kWh maximum Vs 23.6kWh maximum for the Alké
- Maximum payload capacity of 677kg (567kg of which would be the most available for the cargo bed)
- 1133kg towing capacity
- Single electric motor but still decent
- Cargo bed size: 93.3 x 137.8 cm
- Good off-road features, less sophisticated suspension that the Alké but still capable.
- 12v power socket in the bed area

As for the water bowser, there's a couple of possible options after a quick glance:

- Portek seem to have a few good options that include pumps and hoses that would fix in the cargo bed if the Polaris, and even increase capacity (be mindful of payload limits)

https://www.daltonsatvs.co.uk/products/index.php?view=24
https://portek.co.uk/product/spraymaxx-300-litre-demount-sprayer-with-6m-hose-hand-lance/

- There's also Enduramaxx but stock seems to fluctuate

https://www.tractorarmoury.co.uk/enduramaxx-demount-plant-watering-bowser-electric-pump

- https://enduramaxx.co.uk/enduramaxx/300-litre-applicator-tank/

Link to product page:
https://www.polarisbritain.com/ranger/ranger-xp-kinetic/

As for running pumps from these vehicles, a lot depends on the pump used. Anything that can run on the included 12v supplies will not likely impact battery range all that much. To help make the point:

- A 12v pump I could see using up to something like 200 watts at the higher end. If it ran for an hour, that would be 0.2kWh. If used with the 29.8kWh battery from the top spec Polaris, that's a capacity loss of 0.67% per hour of pump running. Or on the lower spec 14.9kWh battery on the Polaris, that's still just a 1.34% capacity drop over hour of pump running.
- The weight from water, equipment, and towing will eat more into the vehicle's overall range than that. So I would not worry about running a water pump or other 12v equipment off the battery.

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