# Xanadu
## "City in the Heavens"
## "Where the Water is Just as Heavenly!"

The city of Xanadu's has marked its place in history with its cutting-edge technology and innovative water conservation system. The water conservation system was designed as a result of water shortages in Xanadu's. Previously, Xanadu was forced to purchase water from bordering countries; however, this problem was rectified with the unique water conservation system.

Recent technological advancements have allowed greater efficiency in Xanadu's water conservation systems. Each house has a cycle that uses and reuses water via the ARC 3000 (Aqua Recycling Center). Once the water is used, it travels down the MUTU (Mini Utilities Transportations Unit) to the ARC 3000. The ARC 3000 uses advanced nanotechnology to filter out the water. Once the water is filtered the purified water goes back into the MUTU allowing the cycle to begin again. This cycle is linked with UTU (Utilities Transportations Unit). The UTU is Xanadu's major utility transporter, and branches off into the residential NUTU (Neighborhood Utilities Transportation Unit), which distributes water evenly to all of the MUTUs. Inside the MUTUs, infrared detectors keep track of the pollution level of the water. If the water pollution passes a certain level, it is sent through another tube in the UTU, reserved only for polluted water, and sent to an advanced water filtration center. It is then sent back into the cycle.

Meanwhile, in each individual house, precautions are taken to maintain water usage. This includes the WVCU (Water Vapor Conversion Unit), which is above every shower stall. Each shower stall is fully enclosed, and as steam is released from the shower, the WVCU, a vent above the shower stall, captures the steam, cools it to the dew point, and releases it into a pipe, connected to the MUTU, which releases it back into the water cycle. Another precaution that is taken is the incorporation of IWCU (Infrared Water Conservation Units). These are small, but powerful infrared detectors at every sink. These not only detect if there is anybody present to use the water, but can recognize the type of object using the water. For example, if a toothbrush is being placed under the water, the IWCU places an automatic timer of 5 seconds, after which the water is automatically switched off. If a large pot is placed in the sink, the IWCU detects the dimensions of the pot in order to instantly determine the amount of water needed.

On the borders of each neighborhood there is a long gutter system to collect rainwater and deposit it back into the UTU. Up in the industrial layer, the Core, all of the pollution is sent upwards into the atmosphere in order to keep the residential zones pollution free. The structure of the Core also conserves water. The concave shape of this layer allows the rainwater to flow to the center, which in turn is deposited back into the UTU, through a hole leading to the Central Shaft, or the large pole containing the UTU. The GoX (Government of Xanadu) has implemented restrictions on building dimensions and designs in order to keep the stability of the factories in check. The GoX has also created over 25,000 environmental engineer jobs. The Eco-Engineers of Xanadu are not only responsible for all of the water conservation systems, but they also maintain and design Xanadu's infrastructure. They also have an extensive knowledge of nanotechnology.

Due to the city's dependence on the UTU system, Xanadu has implemented advanced nanobots to fix a problem with the UTU should anything go wrong. If a major section of the UTU faces a problem, the city is brought under Water Lockdown Mode, where each pod resorts to their BWS (Backup Water Source) until the Lockdown is recalled. The BWS contains water from the gutter system on the boundaries. A portion is taken from the rainwater and sent to the BWS. At the very bottom of the city a large water recycling center collects runoff storm water and as expected, is connected to the UTU. This system allows Xanadu to maximize rainwater. These various water conservation systems keep Xanadu one of the world's largest water producing powers.

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**Essay**

**Heliopolis**

In the twenty first century, it became evident that water would become the most critical natural resource issue facing many parts of the world. For this reason, the Sustainability for Tomorrow Water Program (STWP) was formed in Heliopolis, Egypt. A regional water distribution system was created, and, researchers and engineers worked to develop an aggressive conservation plan with the ultimate goal of equipping all residences with completely self-sustaining closed water systems.

In Heliopolis, the average family residence occupies approximately 2000 square feet, and is located on a one half acre lot. An average family uses approximately 70 gallons of water per person per day. Indoor water usage accounts for under half of all the water used by residential customers. The majority is used for irrigation. In an effort to develop a closed system, water reuse, as well as production and recycling, is a priority. Water is collected from two major sources; rainfall and humidity condensation. Rainfall is collected utilizing a system of landscaping and collection techniques. Humidity condensation is accomplished using solar powered electrostatic filters and a humidity condenser system. This collected humidity system was developed by industrial systems engineers and is designed especially for residential use. The condensed water is clean and requires little filtration. After condensing, water is pumped through nano and UV filters and gravity fed into an underground water bank.

Our water banking systems ensure that water is always available. A household tank can bank between 5000 and 20,000 gallons, which is enough to support a household for over 1/3 of the year. Household water banks are connected to larger community water banks, which hold reserves for instances of severe drought and community use.

Water banks maintain high quality potable water utilizing Zeeweed filtration technology developed by nanoengineers. Before entering water banks, water is filtered to remove solids. Zeeweed uses a nano-pore system to capture over 99.9999% of the remaining contaminants.

Zeeweed technology can be used by individual residential units, eliminating the need for extensive piping and pumping. Earlier, water treatment systems didn't separate different types of wastewater. Waste is redirected towards a containment unit where it is biologically managed and later pumped out and used for soil enrichment. Cleaning of Zeeweed is necessary approximately twice per year based on water usage. Back wash jets of a biodegradable cleaning fluid remove contaminants, sending them to the containment unit.

Water recycling, reuse, and conservation are the backbone of the STWP. Air suction systems minimize toilet water use. Solid and liquid waste is separated. Urine is filtered to extract as much of its

water content as possible and the rest is composted. Feces is extracted of 70% of its water and then used as compost along with the urine additive.

Xeriscaping minimizes water needs, and while sloped land directs runoff towards porous driveways and sidewalks, irrigation systems double as a “net” to collect rainwater. Water troughs are laid out around the property and on the edges of roads, collecting runoff and directing it to a water bank. Irrigation systems efficiently use water by measuring how much water is needed based on moisture content of the soil and the size and species of the plants being watered.

Low flow faucets and showerheads are used throughout Heliopolis. Flashpoint water heaters are used to heat water on demand at the tap. These taps are motion sensitive and only turn on for a limited amount of time, also reducing the overall water usage.

Grey water reuse and minimization is another major part of the conservation effort. Grey water is re-circulated back to its source after passing through a light filtration system and can be reused hundreds of times before sensors flush the system and restart it.

As our society evolves, so too does the need for efficient water management. A vast sensor monitoring network relays individual component water usage, water quality, and waste management data to Heliopolis Water Department Central headquarters. Our success story is, in part, due to the amount of total water we can collect from the atmosphere, but also relies heavily on our water management and delivery system which has allowed water to become a very profitable export for Heliopolis.

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Aqualis

**The Elysium Home**

The Elysium module is a 2000 square feet, 3 bedroom, 2 bath, single residence home, that will comfortably house four occupants. The home sits on a .25 acre lot, and boasts a beautiful Xeriscaped yard. A closer look at water treatment, storm water collection, water recovery, and water conservation within the home will demonstrate how Elysium operates on a nearly closed water system.

Waste Water Treatment

Elysium's water waste purification system utilizes aerobic treatment methods. After the water is treated in the aeration tank, it is disinfected using chlorine tabs, and then passed through the patented Realsoil Greenhouse system. This system uses a replication of the native layers of soil to filter and treat the water. Finally, the water is filtered to a clear potable state using a carbon-based filter. While waste water is converted to potable water, the module also collects rain water as one of its primary potable water sources.

Rainwater Collection

The most effective systems for collecting rainwater is to use an aluminum roof, which keeps the water cleaner than asphalt shingles. Covered gutters and down spouts are utilized to direct storm water to below ground containment units. The rain water is put into the chlorination stage of purification as the house demands. Even with a relatively low annual rainfall of 15 inches, this technology will allow 16,824 gallons of rain water to be collected per year. Water can also be recovered though several other methods.

Water Recovery Methods

Water Collection methods employed in the Elysium home includes the utilization of an A/C Condensation collection system and Organic Waste Dehydration (OWD).

A/C Condensation Collection

The A/C Condensation unit directs water condensation from the air conditioner and puts it in the underground water containment units.

OWD

The OWD works by compressing and dehydrating organic trash and cleaning the water extracted from it. Water is removed using a solar heated waste compactor, then directed to the underground water containment units.

Water Conservation

Water saving technologies that will be employed in Elysium home include low flow fixtures, water efficient washing machines, dishwashers, and inline water heaters. The Elysium house also boasts the following innovative technologies: Express Vibro Hand Sanitizer (EVHS), Teflon Vac Toilets (TVT), Sonic Antibacterial Bath (SAB), and Pre-Calibrated Automatic Sinks (PAS).

EVHS

Aqualis

The Express Vibro Hand Sanitizer (EVHS) works to sanitize and clean hands using a sonic charged gel sanitizer. The gel will be periodically exchanged, heated to a liquid state and passed through a woven filter as needed for cleaning. This technology will save approximately 6,570 gallons of water per year.

TVT

TVT will save approximately 7300 gallons of water per year in comparison to traditional models of toilets. The TVT has a Teflon coating on the inside of the bowl which provides a non-stick surface so less power and water are needed to suck the waste down the bowl with the vacuum.

SAB

The sonar bath works similar to the EVHS. However, the gel temperate can be adjusted for comfort purposes. SAB will save approximately 127,750 gallons of water per year that is typically used for shower purposes.

PAS

The Pre-Calibrated Automatic Sink is a hybrid of current automatic sinks and pre-calibrated drink machines. It dispenses a pre-calculated amount of water and shuts off as soon as the object moves away from the faucet.

A traditional home consumes about 158,775 gallons of water per year. With Elysium's water saving methods in place the home will use less than 16, 155 gallons of water. Gallons of water collected per year will be as follows: rainwater collection system: 16,824 gallons, A/C CRB: 1825 gallons, OWD: about 365 gallons. The Elysium module will have a water surplus of 2859 gallons per year.

In conclusion, the citizens of Aqualis play a key role in maximizing water conservation efforts. In addition to all of the water saving technology used in the Elysium house, the citizens of Aqualis are educated about water conservation and employ simple water saving methods like landscaping with native plant species so yard watering is minimized, shutting the sink off while brushing their teeth, putting more dishes in the dishwasher per load, and taking shorter showers.

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