14.4.4. Operating a Campus Wastewater Treatment System

Safeguarding coastal receiving waters requires not only research into contamination but also working infrastructure that reduces the pollutant load leaving university facilities. Davao Oriental State University (DOrSU) maintains an operational on-campus wastewater treatment system at its Main Campus in Guang-guang, Dahican, City of Mati: a vertical helophyte filter system (VHFS) planted with reed-bed vegetation and accompanied by phytoremediation plants selected for the absorption of heavy metals. The system was constructed during the Davao Oriental State College of Science and Technology (DOSCST) period with collaborators DOST and the University of the Immaculate Conception, and it continues to operate and be maintained today, making it a sustained institutional practice rather than a one-off activity. This entry documents that operating system and its design rationale as DOrSU's contribution to reducing land-based pressures on nearby coastal waters.

The account below distinguishes the documented design and construction of the VHFS from treatment-performance claims reported in the project record. It does not assert new effluent measurements or compliance sampling during Academic Year 2024–2025; current monitoring results would strengthen future reporting on this indicator.

A Nature-Based Treatment System Built for the Campus

The VHFS is a recognized secondary wastewater treatment approach in which effluent from a primary treatment stage, in this case a septic tank and catchment basin equipped with a sediment trap, underflow basins and a pump well, is discharged onto a layered sand filter planted with reeds. The treatment is performed largely by bacteria living on the plant roots: the reeds transport oxygen from the air to their roots through hollow stems, creating an oxygen-rich upper layer that supports aerobic decomposition of dissolved substances, while the deeper soil layers support anaerobic decomposition. The filter bed was sized at approximately 70 square meters to treat the estimated wastewater volume of the connected buildings, and its layers combine coco coir, fiberglass, limestone, and sand and gravel, each serving a distinct treatment purpose.

The phytoremediation component complements the mechanical filtration: plants capable of accumulating heavy metals address the chemical and metal pollutants that laboratory instruction on campus can introduce into the wastewater stream, a concern the project documentation identifies explicitly given the university's operating laboratories. Reported design expectations for this type of system include removal of around 90–95 percent of BOD and up to 99–100 percent of (fecal) coliforms, with near-complete removal of total suspended solids and pH neutralization, consistent with the results DOST Region XI reported for earlier VHFS installations in Davao City.

The treated effluent carries elevated phosphate, nitrate, calcium and magnesium levels by design of the limestone layer, forming a substance comparable to struvite, a phosphate mineral widely used as agricultural fertilizer. The system therefore closes a loop on campus: the outflow is directed to the plant nursery located at the project site, where it supports plant growth instead of discharging untreated wastewater toward the coast.

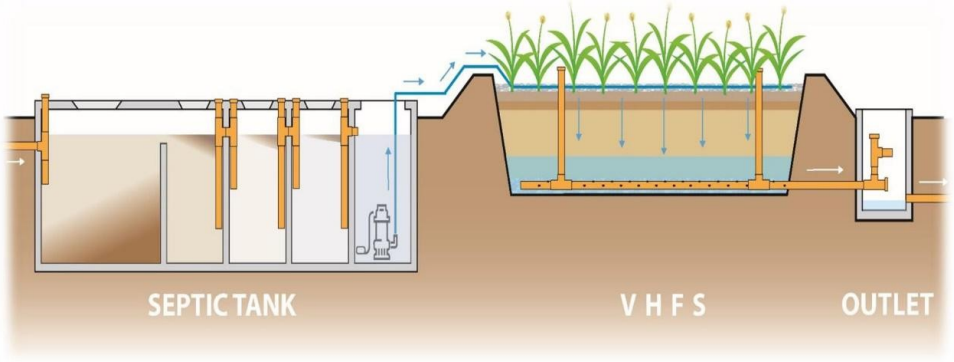

Figure 1. Schematic of the campus wastewater treatment train: the septic tank and catchment stage feed the vertical helophyte filter system (VHFS), whose treated effluent passes to the outlet. Source: DOST Region XI VHFS project documentation for DOSCST, Guang-guang, Dahican, City of Mati.



Figure 2. The constructed vertical helophyte filter bed at the DOrSU Main Campus, showing the layered gravel-sand substrate, distribution piping, and reed-bed planting. The system remains operational and maintained. Photo source: VHFS project documentation.

Sustained Operation as Institutional Practice

What distinguishes this contribution within the indicator is duration. The facility was constructed as part of a DOST-supported program and has been operated and maintained by the university since its completion, continuing to the present reporting period. A treatment system that remains in service year after year functions as an embedded institutional practice: it treats campus wastewater continuously, demonstrates the viability of low-cost, nature-based treatment to students and visitors on a site visible from a main road, and provides a working reference for communities and local facilities considering similar systems.

The educational and demonstrative role is deliberate. The project documentation notes that the site was chosen partly so that the technology is visible to the wider student population, positioning the operating system as a living laboratory for environmental engineering and water management instruction alongside its treatment function.

References

Ponce, A. G., Sumile, E. B., Ponce, R. G., & Polestico, R. A. (n.d.). Wastewater management in Davao Oriental State College of Science and Technology Main Campus using vertical helophytes filter system (VHFS) and phytoremediation plants for heavy metal absorption [Research project documentation]. Davao Oriental State University.

Department of Science and Technology Region XI. (2018). Wastewater Treatment System Upgrading Program (WATS-Up) [Program documentation]. DOST-PCIEERD.

Conclusion

The VHFS at the DOrSU Main Campus stands as sustained, working infrastructure for water-quality protection: constructed with DOST support during the DOSCST period, still operating and maintained today, and treating campus wastewater through nature-based filtration and phytoremediation while returning nutrient-rich effluent to productive reuse at the plant nursery. Its longevity distinguishes it from one-off activities; the system is an embedded institutional practice that treats wastewater continuously, demonstrates low-cost treatment technology to the university community and visitors, and provides a working reference for local facilities considering similar systems. Current-period effluent measurements would complement the documented design performance and further strengthen future reporting on this indicator.