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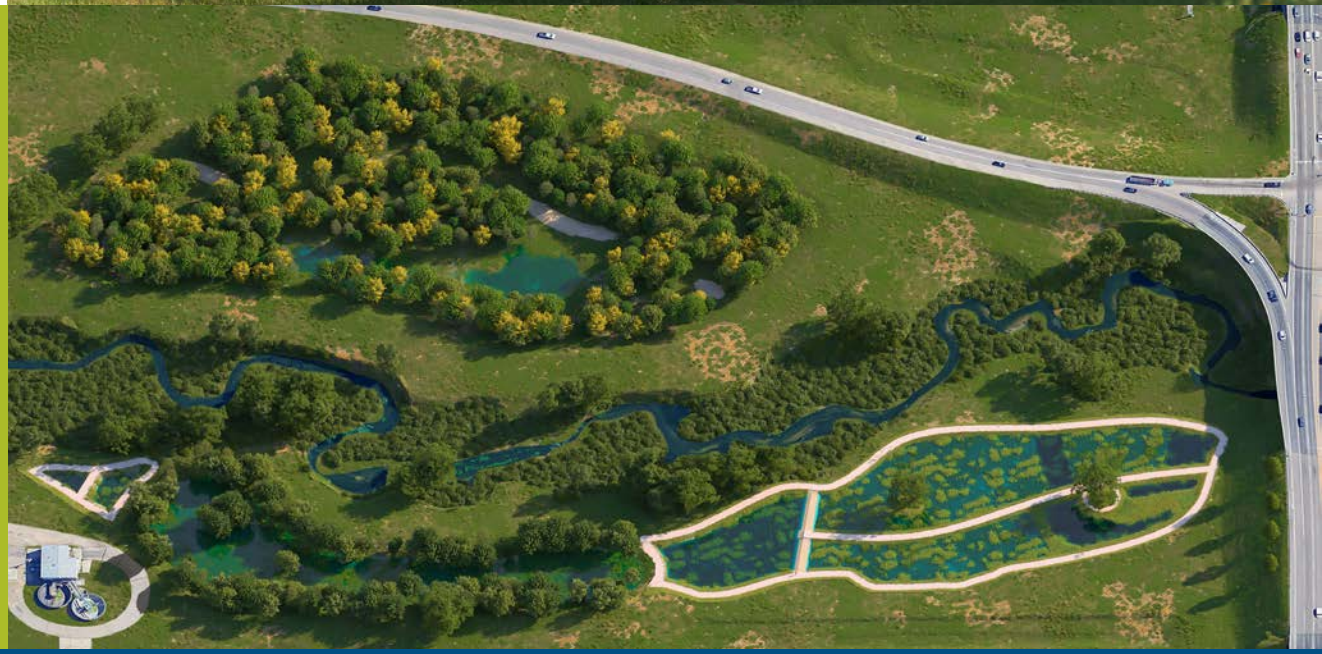
Karcher Constructed Wetland at City of Nampa



WHY

The Columbia River Watershed, which encompasses the Snake River, Boise River, and Indian Creek, are all experiencing significant water quality impairment. These rivers are known to be impacted by and regulated for total suspended solids (TSS), total phosphorus (TP), and bacteria such E. Coli, which are evaluated by Idaho Department of Environmental Quality and the U.S. Environmental Protection Agency. There are several contaminants of emerging concern (CEC) with evidence of causing negative impacts on the health of aquatic species and humans, including 6-PPD Quinone, pharmaceuticals, pesticides, and PFAS (Per- and polyfluoroalkyl substances).



The City of Nampa strives to prevent pollution to the greatest extent possible and secure clean water for the future.

WHAT

The Karcher Constructed Wetland is an approximately 6-acre wetland that will use the latest research in harnessing biological treatment and engineering with nature. This facility will treat between 1-2 million gallons per day (mgd) of river water, stormwater, or wastewater treatment plant effluent. This treatment will improve water quality flowing into Indian Creek by reducing pollutants, including CECs.

Primary Goals





Primary Goals

The Karcher Wetland will be designed to achieve the following objectives:

- **Remove constituents** that cause water quality impairment using proven constructed wetlands design.
- **Reduce water temperature** with shading and deep water cells to improve fish health and survivability.
- **Embed flexibility** to allow for adjustment of operational regimes to test the impacts of variable flow rates, retention times, depths, plant species, and various treatment media in the polishing cell.
- **Partner with local stakeholders** and universities to support long-term water resilience.

This wetland will be able to remove sediment, phosphorus, nitrogen, CECs, and bacteria, in addition to cooling the water, using the following design features:



Sedimentation Basin: Designed to slow water velocity to physically settle out and store sediment as it settles to the bottom of the basin. This mitigates sediment-bound phosphorus.

Treatment occurs through settling of sediment, anaerobic biodegradation, and sorption.



Free Water Surface Wetlands (FWS): In a FWS wetland, the water surface interacts directly with the atmosphere. These wetlands have deeper open water areas and rooted vegetation in more shallow areas with deep roots that play a vital role in nutrient cycling, water purification, and habitat. These cells can have varying depths to accomplish different goals.

Treatment occurs through plant storage and update, photolysis, aerobic biodegradation, sedimentation, soil treatment through infiltration, and shaded cooling.



Subsurface Flow Bioreactor Wetlands (SF): These wetlands are comprised of sand, rock, or gravel, and oftentimes organic carbon media including wood chips, saw dust, and straw, which are planted with wetland vegetation. The water surface is underground and not exposed to the air and plants are rooted in the media, which is colonized with bacteria and micro-organisms that facilitate biological reactions and treatment.

Treatment occurs through plant storage, carbon bonding and storage, and anaerobic biodegradation.



Polishing Cell: Polishing cells are permeable reactive barriers or horizontal levees that provide reliable and consistent treatment by flowing water through media with high adsorptive capacity, such as Zeolite, Activated Carbon, Fluoro-Sorb, or Biochar, which have all been proven to remove contaminants through other water treatment applications.

Contaminants are primarily removed by adsorbing to media or by ion exchange.