

Whole Effluent Toxicity (WET) Testing Of Produced Water

What is WET testing?

- Whole Effluent Toxicity (WET) testing is a form of biological monitoring used to predict whether a treated water discharge will have toxic effects on organisms in the receiving waters. It has been used by the United States Environmental Protection Agency (EPA) since 1974 in evaluating the environmental impacts of constituents in a wide range of treated waste waters, including treated off-shore produced water.
- WET testing is designed to use indicator species in laboratory environments to provide an indication of the toxicity of a treated and discharged waste water to both environment and local ecology.
- Typically, evaluation is performed on certain representative species approved by the EPA and include plant life, such as green algae; insects, such as the Daphnia water flea; aquatic species such as minnows or trout, and more recently zebra fish and terrestrial species such as cattle.
- Careful analysis of the growth, maturation, and reproduction of these various indicator species is closely monitored to predict long-term toxicity issues from a specific discharged treated waste water quality.



WET testing of Treated Produced Water by the Consortium

- The New Mexico Produced Water Research Consortium (Consortium) is working closely with commercial certified WET testing laboratories, and with experimental WET testing laboratories at both NMSU and the EPA to expand laboratory testing to more representative human and ecologically sensitive species.
- These include fresh water mussels and zebrafish. Zebrafish have been researched extensively because they have over 80% similarity in genetic makeup as humans.
- Duplication of the standard WET testing results from certified and research labs, combined with the new approaches and species being coordinated by the EPA for testing by them and NMSU, should provide the public with high assurance of the quality and safety of various fit-for-purpose treatment and reuse options for produced water.



Additional Consortium Efforts on Toxicology Assessment

- In addition to coordinating research efforts with the US EPA, commercial laboratories, and research facilities at NMSU on state-of-the science WET testing, the Consortium is pursuing four distinct strategies to assess human, animal, and plant and soil exposure and potential risk and toxicity to treated produced water discharges. These include:
 1. As noted in this fact sheet, collaborative state-of-the-science WET testing in cooperation with the EPA, NMSU, and commercial laboratories,
 2. Human cell line testing in cooperation with the US EPA Office of Research and Development on human risk and toxicology to treated produced water discharges,
 3. Plant and soil bioaccumulation and toxicity testing in green houses at NMSU, and
 4. Use of State-of the-science chemical analysis and spectroscopy by the EPA, NMSU, and commercial laboratories on raw and treated produced water for chemical analysis of constituent identification and quantification.

This multi-pronged chemical, toxicological, and human health and safety testing strategy has two advantages. First, it will provide an overlapping level of analysis and evaluation of the human and environmental health impacts of produced water treatment and reuse. Second, it will provide more confidence in the safe treatment and use of specific fit-for-purpose uses of produced water across New Mexico.

References and More Information

- New Mexico Produced Water Research Consortium website: <https://nmpwrc.nmsu.edu/>
- WET Testing: <https://www.epa.gov/cwa-methods/whole-effluent-toxicity-methods>
- Why Use Zebrafish to Study Human Diseases - NIH Intramural Research Program: <https://irp.nih.gov/blog/post/2016/08/why-use-zebrafish-to-study-human-diseases>
- Zebrafish Help Unlock Clues to Human Disease - John Hopkins Medicine News and Publications: <https://www.hopkinsmedicine.org/news/articles/zebrafish-help-unlock-clues-to-disease>
- Zebrafish as a Model Vertebrate for Investigating Chemical Toxicity - Oxford Academic Toxicological Sciences: <https://academic.oup.com/toxsci/article/86/1/6/165409>

Questions

- Contact the Consortium at: nmpwrc@nmsu.edu