Two types of impact on water from well stimulation technology (WST):

Water Use — Sourcing of water for well stimulation.
Water Quality — Potential contamination of water resources during the handling, treatment, disposal and secondary (beneficial) uses of stimulation fluids and wastewater.

Key Questions Addressed

How does WST affect water resources?
- How much water is used for WST?
- What type of water sources are used, such as freshwater?
- Where does water used for WST come from?
- Composition and characterization of WST fluids such as the use of chemical additives.
- Environmental hazards of WST fluid additives.

What are the impacts of wastewater collected from the WST process?
- How much wastewater is collected as a result of WST?
- Composition and characterization of wastewater.
- Wastewater management and disposal practices.

How much water is used for WST?

What practices could minimize use of freshwater resources and reduce the risk of water contamination?

Potential effects of WST on surface water

- Acids, fracturing fluid, metals
- To calculate total use:
  1) Water used per WST operation
  2) Monthly estimate of well stimulations

Potential effects of WST on groundwater

- Produced water, flowback water
- To evaluate impacts at the local level:
  - Examine within Planning Areas
  - 56 PAs in CA (DWR)
  - 320 to 7,500 square miles
  - Typically follow watershed boundaries

Water Sources

- Identify where the water used for WST comes from?
- Evaluate amount of wastewater produced.
- Evaluate disposal methods:
  - Evaporation-percolation
  - Subsurface injection
  - Others?
- Evaluate reuse efforts:
  - Enhanced oil recovery, crop irrigation, base fluid for WST

Water Contaminants

- 69 chemical additives are used in significant amounts (≥200 kg per treatment) including proppants, solvents, crosslinkers, gels, and surfactants.
- Review previous research investigating water resource contamination due to WST.

Environmental hazards and toxicity
- Environmental persistence
- Identify and characterize compounds, especially for wastewater.
- Identify available baseline and on-going monitoring studies

Case Study Area | Water-Related Concerns
--- | ---
San Joaquin Valley | Produced water disposal
Los Angeles | Disposal methods of flowback/produced water at well and basin levels in LA County
Monterey Formation Shale | Surface and groundwater stress
Offshore production | Accidental releases

What would you like to see addressed in the case studies related to water?

Next Steps

1) Identify toxic high-use contaminants that need further analysis in fate and transport studies.
2) Evaluation of future WST projects.
3) Conduct the following case studies:

Contact Information

California Council on Science and Technology
Email: ccstreports@ccst.us
http://www.ccst.us
Lawrence Berkeley National Laboratory
Email: Carol Chien clchien@lbl.gov
http://www.lbl.gov

Are your concerns about water used in WST represented in this draft? How so? What other questions would you like this study to address?