WESTCAS 2011 Winter Conference

WERF-City of Los Angeles Targeted Collaborative Research

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WERF
Water Environment Research Foundation

Who is and… What Does WERF Do?

- Not for Profit Foundation Focused on Water Environmental Research
- Provide Peer-Reviewed Research That Advances Science and Technology to Find Solutions for Wastewater and Water Quality Issues
- Deliver Results That Subscribers Can Use
- Foster Partnerships and Collaborations Between Subscribers, Water Sector Organizations, Policy Makers, Regulators, and NGOs

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Who Supports WERF Research?

- WERF's 300+ Subscribers:
  - ✓ Public Utilities (WW and SW Agencies)
  - ✓ Environmental and Engineering Firms
  - ✓ Industry
  - ✓ Equipment Manufacturers
  - ✓ State Regulators
- Federal Funding
- Partnerships and Collaborations

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Partnerships

- Water Research Foundation (WRF)
- Global Water Research Coalition (GWRC)
- National Association of Clean Water Agencies (NACWA)
- Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)
- United Kingdom Water Industry Research
- U.S. Environmental Protection Agency (US EPA)
- Water Environment Federation (WEF)
- Water Reuse Foundation
- WERF Subscribers through "TCR" *(Targeted Collaborative Research)*

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Terminal Island Renewable Energy- TIRE
L.A. Biosolids Slurry Injection Project

- Nation's first full scale application of deep well injection technology
- Utilizes abandoned/depleted oil & gas reservoirs
- Uses proven technology widely used in the petroleum industry
- Converts biosolids to bio-methane through deep subsurface placement, thermal treatment & biodegradation, while sequestering GHG's
- Uses the generated methane in fuel cell units to produce green power
- Offers a long-term solution with superior economics
- Environmentally-sound with renewable energy benefits

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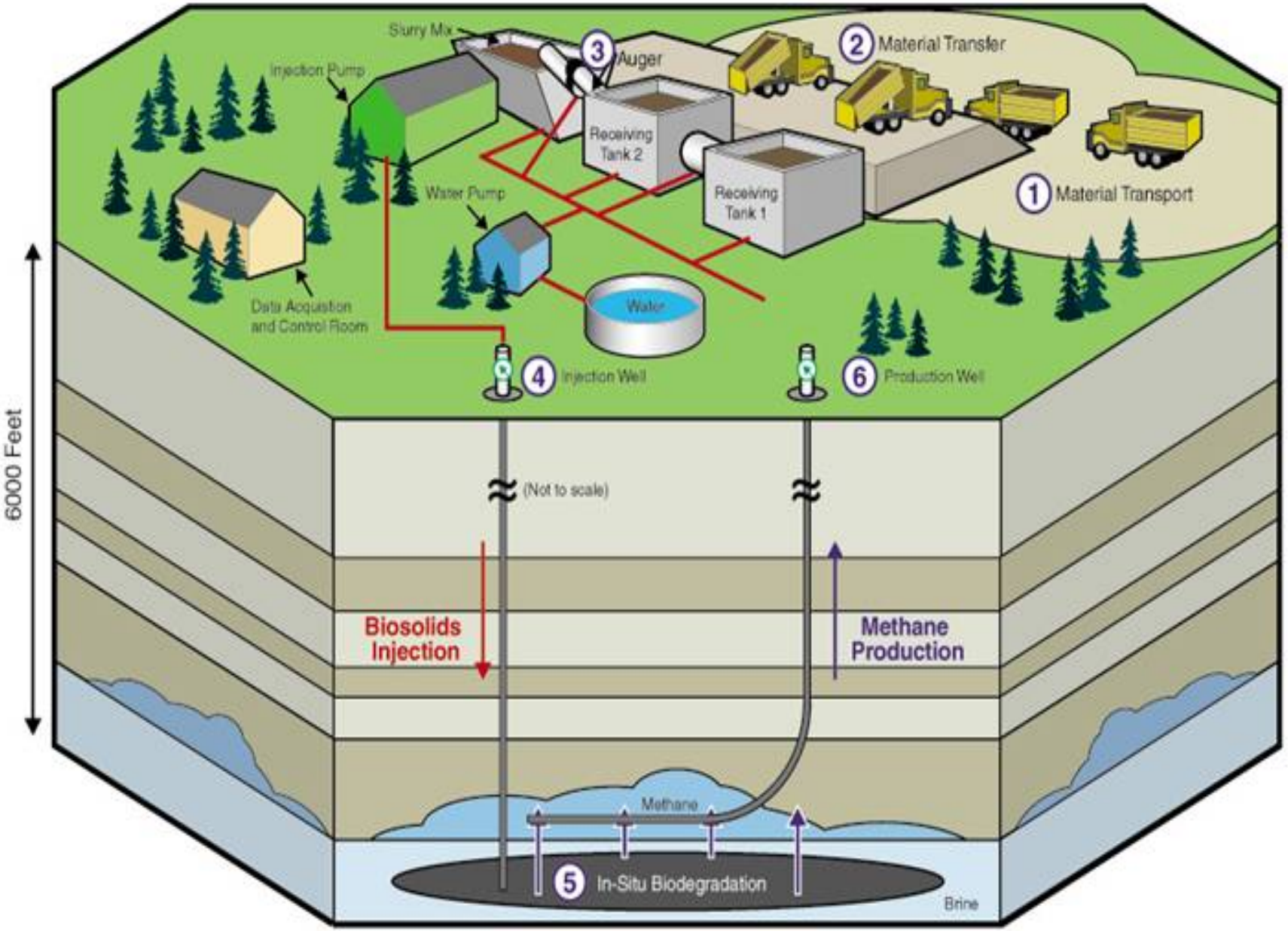
Biosolids Processing Summary



Regional Oil Fields

San Vicente Salt Lake
Los Angeles
Beverly Hills
Sawtelle
Cheviot Hills
Las Cienegas
Montebello
Proposed OFWD
Inglewood
Whittier
Sansinena
Potrero
Bandini
Playa Del Rey
Brea Olinda
Rosecrans
Santa Fe Springs
Coyote
El Segundo
Yorba Linda
Dominguez
OFWD 1997
Kraemer
Richfield
Torrance
Long Beach Oil Field
Pacific Ocean
Seal Beach Oil Field
Proposed OFWD
N
Wilmington Oil Field
Belmont Offshore
Newport
Huntington Beach
Oilfield waste disposal (since 1994)
0 4 8 12
Scale in Miles
LB DOP

Overview of Permit

- Class V, Experimental
- Up to 5 years, in two phases:
  - Phase I: 6 months start up (~120 tpd)
  - Phase II: 4.5 years operation (up to 200 tpd)
- Three formation zones
- Daily injection period: Up to 16 hrs
- Biosolids: 120 to 400 wt per day
- Liquids: up to 400,000 gallons per day

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PROJECT FEATURES

- A 5-years demonstration project
- Uses a multiple casing, heavily protected delivery well for the placement of biosolids;
- Natural heat deep in the earth biodegrades the material to methane and carbon-dioxide;
- Placement zone is protected by at least a dozen impermeable confining layers and major fault lines:

  Isolation, Protection, and Confinement;

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PROJECT FEATURES

- 2 (existing) + 1 (new) wells for injection and monitoring
- Wells are being monitored by a series of state of the art technologies, including:
  - Geophones, tilt meters, gamma ray, density meters, pressure, temperature, micro-seismograms, etc.
  - Signal from USGS, and area of review (3 wells)
- Extensive lab analysis: gas, formation fluid, pathogens, etc.
- Depressurization period (8-10 hours)
- Phased approach in increasing the process capacity, up to 200 tons and 150,000 gal per day

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TIMELINE/STATUS

- Project broke ground April 2007
- Monitoring wells drilled in June and July 2008
- Equipment successfully tested with brine and effluent August 2008
- Start–up phase successfully implemented ahead of schedule
- Digested sludge successfully injected since August 2008

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TIMELINE/STATUS

- First biosolids successfully and continuously injected September 2008
- Project has met and exceeded all environmental requirements
- All regulatory requirements met
- Improved air quality, protected water quality, and odor free operations
- Provided substantial cost savings to tax payers
- Successful fast-track, targeted renewable energy project even with the many environmental, and regulatory challenges
- Close to 80,000,000 gallons of cumulative slurry injected

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HOW YOU CAN PARTICIPATE

- WERF and City of LA partnering to develop a joint Targeted Collaborative Research (TCR) for organizations wishing to examine and advance this technology for potential local application
- Work together to fund research utilizing WERF's management processes and technical peer review oversight
- WERF is accepting expressions of interest and will host a webseminar to discuss how the existing demonstration project can be expanded utilizing WERF's TCR process

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Other TCR Opportunities

- Nutrients Research
- Trace Organics in Biosolids
- Zero Liquids Discharge Technology Demonstration in Colorado
- WERF's New Research Challenges
  - Next Generation Wastewater Reuse
  - Remote Detection/Sensors
  - Wastewater as a Resource
  - Energy in Wastewater

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For Additional Information

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www.werf.org

Project Web Site:
http://www.lacity.org/SAN/biosolidsems/TIRE.htm/

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GEOLOGY

- Injection target: 3,800 to 5,300 ft
- 56-ft-thick sand found at 5,150
- injection zone porosity: 22.0%
- Permeability: 280-900 mD
- Formation Capacity:

1 million barrels in 5-years

Sidewall Core Sample at 5,165 ft.

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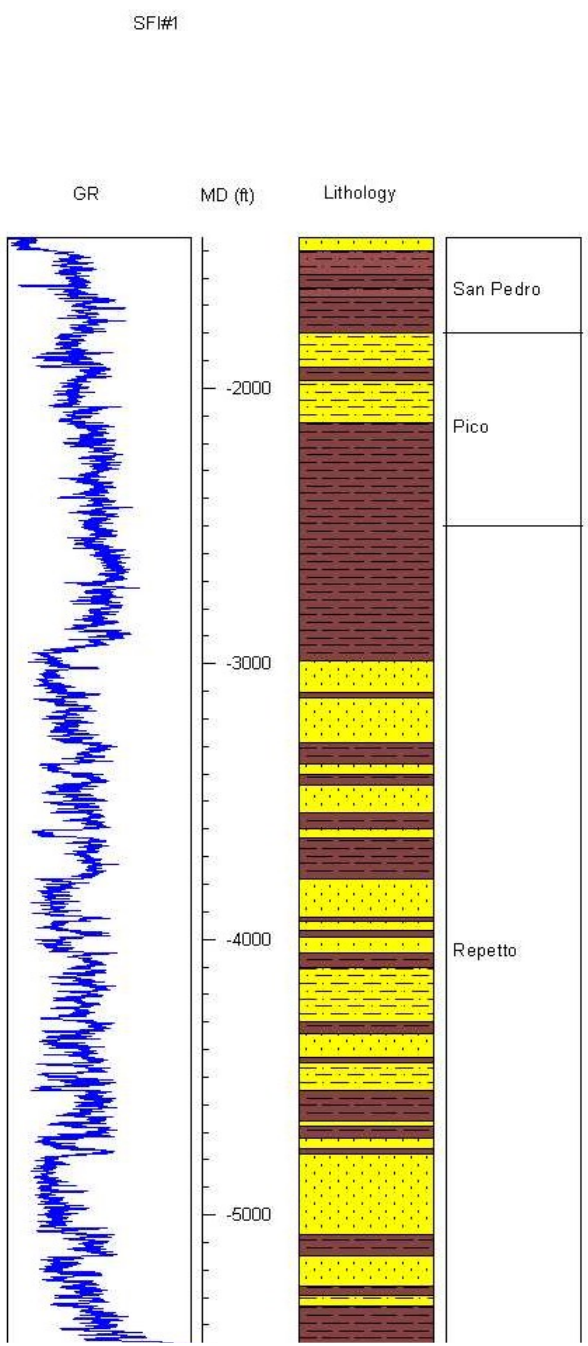

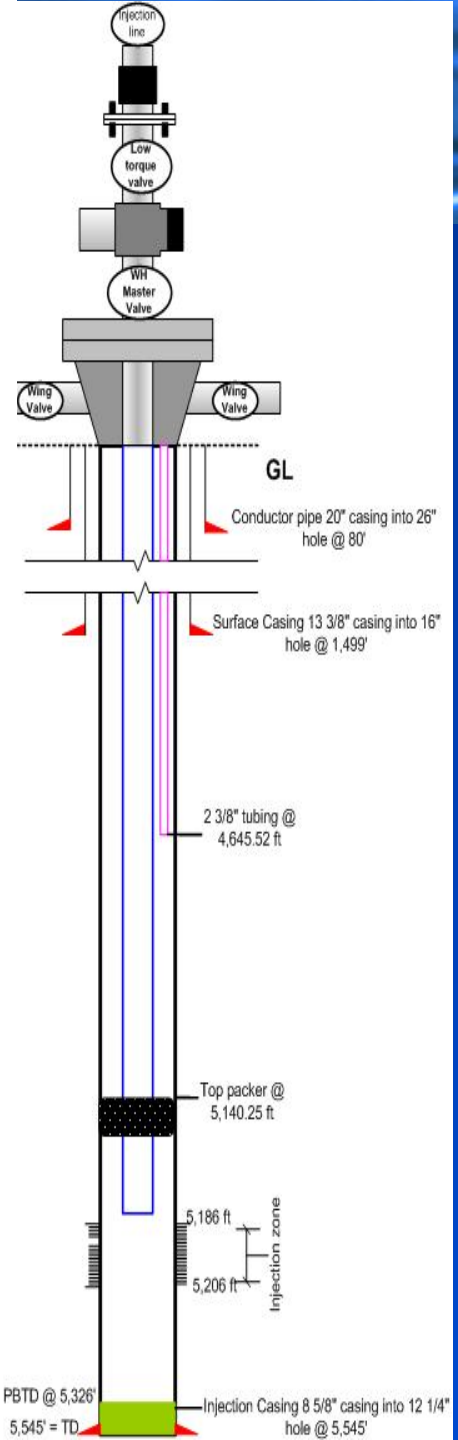

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