

APPENDIX D

Biosolids Research Funded by WERF

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Project No. Title Contracting Organization	Research Objectives	Status
90-4 Innovative Process Assessment: Sludge Processing, Disposal and Resue, Black & Veatch	Provides an assessment of diverse research and development projects regarding the treatment and disposal of wastewater biosolids	Completed
91-ISP-5 Polymer Characterization and Control in Biosolids Management, Univ. of Delaware	Provides information on optimal usage of chemical conditioners for biosolids dewatering. Assesses automatic polymer feed equipment. Provides a formal protocol for making decisions on selecting polymers and estimating dosing rates	Completed
91-ISP-4 Document Long Term Experience of Biosolids Land Application Programs, Black & Veatch Consultants	Provides information on the beneficial use of biosolids in land application programs	Completed
94-Rem-1 Defining Biosolids Stability: A Basis for Public and Regulatory Acceptance, Univ. of Massachusetts	Provides information biosolids stability criteria and recommends definitions for stability for various biosolids processes and products	Completed
91-TFT-3 Biodegradation of Organic Pollutants in Anaerobic Digestion, Univ. of Washington	Provides a better understanding of the dehalogenation process and transformation of organic pollutants in anaerobic environments	Completed
92-TFT-2 Evaluation of Biodegradation Rates of Toxic Organic Compounds, Clemson Univ.	Develops simple, pragmatic, predictive expressions that can be used in design and simulation models of aerobic biological treatment processes. Effort advances understanding of the removal of toxic and other synthetic organic chemicals	Completed
96-REM-1 Innovative Biosolids Processes, Camp, Dresser & McKee Consultants	Identifies and reports on more than 110 innovative biosolids processing and management technologies	Completed
96-REM-2 Assessment of the Uses of Biosolids and Their Effects in Watersheds, Environmental Ground Inc.	Assesses available information (more than 1,400 references spanning 100 years) on the uses and impacts of biosolids in watersheds	Completed

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92-PUM-IC0 Long-Term Fate of Land Applied Wastewater Materials, New York State Energy Research and Development Authority	Assesses implications of applying biosolids products to land, focusing on transport and plant uptake of contaminants from amended soils	On-going
91-ISP-1 Evaluate and Quantify Biosolids Incinerator Emissions, Black & Veatch	Develop database on incinerator emission characteristics; determine performance evaluation for various airborne contaminant control options (including hydrocarbons)	Completed
93-CTS-1 Equilibrium and Rate of Heavy Metal Uptake by Wastewater Particulates, Univ. of Delaware	Advances our understanding of the transport and fate of various species of metals in wastewater treatment processes	Completed
94-REM-2 Influence of Polymer Chemistry on Biosolids Products and the Environment, Univ. of Delaware	Examines polymer use, the impact of recycle on upstream treatment processes and its environmental fate. Also examines analytical methods to detect polymer	Completed
95-REM-1 Demonstration of Soil Remediation with Biosolids to Reduce Metals Bioavailability, UDSA-ARS	Provides information on the relative bioavailability of soil-borne metals (primarily lead) when mixed with biosolids, demonstrating the “tailor-made” biosolids applications are cost-effective and environmentally friendly	On-going
95-REM-3 Understanding Fate, Transport, Bioavailability and Cycling of Metals (Molybdenum) in Land Applied Biosolids, Univ. of Florida	Improves understanding of risks and the pathways associated with metal uptake (focussing on molybdenum) in grazing animals. Enhances scientific knowledge base and provides information relative to EPA’s Part 503 regulations on Molybdenum	Completed

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97-REM-2 Pathogen Destruction Efficiency in High Temperature Digestion, East Bay MUD	Compiles information on high temperature digestion studies. Project designed to develop practical and economical high temperature (mesophilic/thermophilic) digestion protocols to yield Class A biosolids products and augment existing processes to further reduce pathogens	On-going
97-REM-3 Nitrogen Management Protocols for Biosolids Beneficial Use, Univ. of Arkansas	Will result in practical guidance for biosolids managers and regulatory agencies in using biosolids to benefit crop growth and in minimizing the potential for nitrogen to migrate to groundwater or cause surface water pollution	On-going
Enhancement of Conditioning and Dewatering Processes by Electrical Arc Pretreatment, Univ. of Delaware	As a pretreatment aid for conditioning and dewatering processes and develop a resource document to provide information on performance, reliability and projected costs of the processes	On-going
97-REM-5 Assessing Bioavailability of Metals in Biosolids-amended Soils: Root-Exudates and their Effects on Solubility of Metals, Univ. of California, Riverside	Will provide better understanding of the complex phenomena that control the fate of metals in biosolids and soil mixtures, and insight into the mechanisms of metal uptake from soils to plants and the impacts on ecological and human health	On-going
95-REM-2/97-REM-1 Class A Biosolids through Storage and Air Drying: Research to Establish Practical Temperature Range of the Process of Lagoon Storage of Biosolids for Eliminating Pathogens, Brown & Caldwell	Will support the Pathogen Equivalency Committee's certification of a biosolids process that includes long-term storage as the definitive unit process for Class A pathogen control	On-going

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98-REM-1 A Dynamic Model to Assess Microbial Health Risks Associated with Beneficial Uses of Biosolids, Univ. of California, Berkeley	Will develop an assessment framework for microbial exposures associated with beneficial biosolids reuse, and a streamlined protocol to assess risks from various exposure pathways	On-going
98-REM-3 Optimizing Thickening and Dewatering Operations through Automation, Carollo Engineers	Will determine state of current practices, screen and field test selected automation processes. Will provide information to improve dewatering operations to cut the cost of dewatering biosolids in POTWs and in downstream operations.	On-going
99-HHE-3 Develop Methods to Detect and Enumerate Human Parasites in Municipal Biosolids	Will screen, identify, and select an appropriate surrogate human parasites(s) in lieu of helminth ova), then develop protocols to recover, detect, and measure the selected surrogate organism(s) for municipal wastewater biosolids	To be contracted
99-PUM-1 Evaluate Risks and Benefits of Soil Amendments Used in Agriculture, Camp, Dresser & McKee Consultants	Will determine risks and benefits, advantages and disadvantages associated with the use of a wide variety of soil amendments (biosolids, manures, composted organic material, etc)	On-going
99-PUM-2 Characterizing the Forms, Solubilities, Bioavailabilities and Miniseralizaiton Rates of Phosphorus in Biosolids, Commercial Fertilizers and Animal Manures (Phase 1), University of Florida	Will provide information relative to phosphorus in biosolids as well as other nutrient rich products, and the biosolids/product-soil matrices that can be used to assist in the development of workable and environmentally sound phosphorus management plans	On-going
99-PUM-3 Developing Protocols for Measuring Biosolids Stability	Will develop standard, detailed protocols for conducting tests that are commonly used to assess stability in the associated biosolids/ products	To begin in 2000
99-PUM-5T National Manual of Good Practice for Biosolids, Sear Brown Group	A targeted collaborative project to develop a resource document for management of biosolids that addresses the issues to be considered when designing and implementing a biosolids management program.	Ongoing
99-PUM-6-ET Applying Near-Infrared Spectroscopy for the Rapid Analysis of Biosolids and	An emerging technology program project to evaluate the feasibility of applying near-infrared spectroscopy (NRS) widely used in commercial and industrial applications, to	On-going

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Amended Soil, PDK Projects	analyze nutrient and heavy metal concentrations in biosolids and receiving soils	
00-PUM-5 Literature Review, Case Studies and Survey Public Perception of Biosolids Recycling	Will provide municipalities and authorities with insights as to approaches to public relations, education and involvement	To begin in 2000
00-PUM-6 Assessment of Bioassay Procedures for Biosolids	Will provide a means to address concerns about human health and environmental impacts from reuse of biosolids	To begin in 2000
00-PUM-7 Development of a Cost Determination Protocol for Use in Benchmarking Biosolids Management Programs	Will help Utility managers evaluate cost of programs and develop comparisons to private sector costs	To begin in 2000
00-PUM-8CO Biosolids Management Decision Support (and Education Materials) for End-users	A resource on biosolids application for land managers to ensure effective, efficient reuse	On-going
00-CTS-10 Evaluate Feasibility of Methods to Minimize Biomass Production from Biotreatment	Will examine ways of reducing excess biomass production from biological wastewater treatment, which would reduce operation costs and liabilities	To begin in 2000
00-HHE-5 Assessment of Municipal and Industrial Odour Sources and Control Technologies from Collection System through Final Use	Will evaluate perceptions and the latest knowledge about odours and odour control. Will present an assessment of municipal, industrial and public concerns. Evaluate state of knowledge and science about odour and odour control for all stages of treatment and disposal of wastewater residuals including biosolids	To begin in 2000

Anticipated Future WERF Research Projects on Treatment & Management of Residuals and Biosolids
Improve understanding of various chemical conditioning factors on thickening and dewatering properties of biological sludges
Innovative Techniques to reduce water content of dewatered sludges
Develop physical, chemical and/or biological pretreatment methods to improve sludge digestion
Relationship between process operation conditions and dewaterability of waste biological solids
Establish anaerobic digestion re-rating protocols
Thickening and dewatering protocol development
Assessment of the fate of pathogens in biosolids
Assessment of the relationship among stability measures and odor potential, vector attraction and pathogen reduction
Evaluate impacts of biosolids metals on soil biology
Verify Binding of metals in contaminated soils
Development of phosphorus management protocols for biosolids
Maximizing soil carbon sequestration using biosolids – field scale studies
Linkage between biosolids application and precision farming practices
Risks from Radionuclides in Biosolids
Fate of mercury and other toxic metals in incineration of biosolids

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