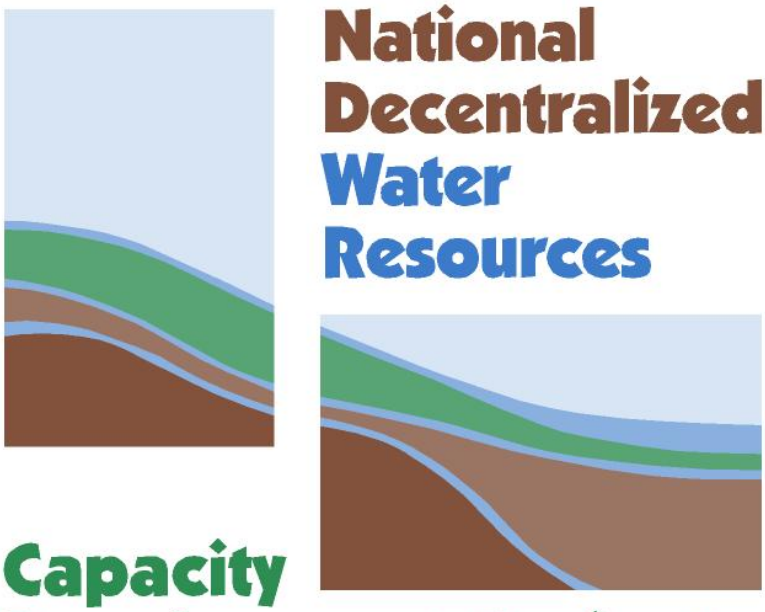

Status Report on Cooperative Agreement Number CR827881-01

November 1, 2004

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NATIONAL DECENTRALIZED WATER RESOURCES CAPACITY DEVELOPMENT PROJECT

Status Report on Cooperative Agreement Number CR827881-01-0
November 1, 2004

HISTORY

The National Decentralized Water Resources Capacity Development Project (NDWRCDP) was formed in 1996 through a collaborative effort to coordinate and implement a national training, research, and development agenda in decentralized water resources. Founding organizations include the Coalition for Alternative Wastewater Treatment (CAWT), the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT), the Electric Power Research Institute (EPRI), the National Rural Electric Cooperative Association (NRECA), and the Water Environment Research Foundation (WERF).

Funding for the NDWRCDP was initiated by the U.S. Congress in 1996 in response to growing needs for cost-effective water resource management in rural and suburban areas. The funds were assigned to the Environmental Protection Agency's Office of Research and Development (USEPA-ORD). The first appropriation in the FY'97 budget was for $250,000. This funding was administered by the Electric Power Research Institute, on behalf of the collaborators, and was used to sponsor white papers and a national workshop, "Risk-Based Decision-Making for Onsite Wastewater Treatment" as a basis for identifying priority training, research and development needs. Subsequent appropriations for FY'98 through FY'01 are being administered by Washington University in St. Louis (WUSTL) through a Cooperative Agreement (CR827881-01-0) with USEPA-ORD established in September 1999 and scheduled for close-out in May 2005.[1]

MISSION

Since the establishment of the Cooperative Agreement with WUSTL, the focus of the NDWRCDP has primarily been on support of research and development aimed at improving our understanding and strengthening the foundations of training and practice in the field of onsite/decentralized wastewater treatment. The goal of these efforts is to break down barriers to the full application of the decentralized wastewater management approach, and fill in critical information gaps in order to develop the capacity of community leaders, regulators, service providers, and others to respond to the increasing complexities of and expanding need for onsite/decentralized wastewater treatment.

[1] Appropriations in FY'02 and subsequent years are being administered by the Water Environment Research Foundation and other founding collaborators through a separate Cooperative Agreement with USEPA-ORD.

In recent months, efforts have been underway to expand the focus of the NDWRCDP beyond wastewater management to consider broader aspects (soft-path) of integrated water resource management, including distributed stormwater practices, low impact development, and other decentralized or nonstructural approaches to water and wastewater management.

ORGANIZATION AND MANAGEMENT

NDWRCDP fiscal administration and project contract management is provided by Washington University in St. Louis through a Cooperative Agreement with the USEPA-ORD. Prior to his retirement from USEPA in January 2001, Jim Kreissl served as the USEPA Project Officer responsible for oversight of the Cooperative Agreement with Washington University in St. Louis. Donald Brown, Environmental Engineer with ORD's National Risk Management Research Laboratory, now serves as the USEPA Project Officer responsible for the NDWRCDP.

The NDWRCDP Principal Investigator at WUSTL is Jay Turner, D.Sc. Dr. Turner is responsible for overseeing the Project Coordinator and ensuring program implementation in accordance with the Cooperative Agreement.

Andrea Shephard, Ph.D. under contract with Washington University serves as the Project Coordinator for the NDWRCDP. The Project Coordinator is responsible for coordination and management of all activities associated with implementation of the NDWRCDP Cooperative Agreement, including steering committee meetings; project procurement, project peer review, billing and reporting; and implementing communications policies with the public and other interested parties. Additional assistance, primarily with steering committee administration and meeting management is provided by the EPRI Community Environmental Center at Washington University in St. Louis.

A Project Steering Committee (PSC) was established in 1999 to provide strategic direction and guide the distribution of NDWRCDP research and development funds under the current Cooperative Agreement. The PSC is currently comprised of representatives from six NDWRCDP cooperating institutions, and three At-Large members with expertise and experience in the onsite/decentralized wastewater field (**Table 1**). Raymond Ehrhard, P.E., EPRI, serves as the Chair of the PSC. Specific responsibilities of the PSC include establishing NDWRCDP research and development priorities, allocating research and development funds, and approving project awards.

Each member of the PSC, based on their individual area of expertise, also serves on one or more Project Subcommittees, of which there are currently four: (1) Environmental Science and Engineering, (2) Management and Economics, (3) Training and Education, and (4) Regulatory Reform (**Table 2**). The Project Subcommittees are responsible for developing projects based on established research and development priorities, reviewing and recommending proposals for funding, providing technical monitoring, and evaluating project deliverables.

Table 1. Present NDWRCDP Project Steering Committee Members

Member	Representative	Service Period
CAWT	Valerie Nelson	09/99 – present
CIDWT	Ted Loudon	09/99 – present
EPRI (*shared seat*)	Ray Ehrhard	09/99 – present
EPRI (*shared seat*)	Tom Yeager	09/99 – present
NOWRA	Jean Caudill	03/01 – present
NRECA	Scott Drake	04/02 – present
WERF	Jeff Moeller	08/02 – present
Member-At-Large	Jim Kreissl	03/01 – present
Member-At-Large	Richard Otis	09/99 – present
Member-At-Large	Jerry Stonebridge	09/99 – present

Table 2. NDWRCDP Project Subcommittees

Subcommittee	Members
Environmental Science and Engineering	Tom Yeager (Chair) Ted Loudon Jeff Moeller Jerry Stonebridge
Management and Economics	Ray Ehrhard (Chair) Jean Caudill Jim Kreissl Scott Drake Valerie Nelson Tom Yeager
Training and Education	Jim Kreissl (Chair) Scott Drake Ted Loudon Valerie Nelson Richard Otis
Regulatory Reform	Jean Caudill (Chair) Ray Ehrhard Richard Otis Jerry Stonebridge

FUNDING

USEPA funding for this cooperative agreement originated from Congressional line items which earmarked funding specifically for the NDWRCDP. The cooperative agreement was established in 1999 for $4,875,000, which included FY'98 and FY'99 Congressional line items. A supplemental award was made in 2001 for an additional $3,335,000, which

included FY'00 and FY'01 Congressional line items. Thus, the total budget for NDWRCDP activities under the cooperative agreement between USEPA and Washington University is $8,210,000 (project period September 1999 through May 2005). **Figure 1** and **Table 3** show the distribution of this budget by cost category. 58% of the budget is directed towards research and workshops. As of October 2004, all of the research budget (55% of the overall NDWRCDP budget) was programmed to specific projects funded through subcontracts executed with a range of institutions. (See **Attachment A** for project descriptions.) NDWRCDP sponsored or co-sponsored two strategic planning workshops – the Future Mapping® workshop and the Integrated Water Resources workshop – and recently convened two additional meetings[2] of the subcontracted research investigators and invited guests to evaluate and synthesize the accomplishments of NDWRCDP-funded research and development projects.

Research Management – 13% of the overall NDWRCDP budget – covers expenses for the Project Steering Committee (PSC) members towards developing and implementing the overall research strategy and also critically reviewing progress and deliverables generated by the subcontracted research projects. Activities include (but are not limited to): development of policy and outreach strategies, creation of project concepts, review of proposals, project technical-content monitoring, review of project quarterly status reports and final reports; and information exchange activities with the USEPA–funded Community Demonstration Projects.

Administration expenses are 23% of the overall budget and include the administrative core staff (Washington University Principal Investigator; EPRI-CEC staff support; and NDWRCDP Project Coordinator), that conduct the day-to-day operations in accordance with PSC and WUSTL policies.[3] The Washington University administration budget also includes indirect costs assessed by the university on each research subcontract.

The NDWRCDP maintains a web site for the dissemination of information on its activities and facilitation of research management tasks, and also publishes various reports; these costs are programmed at 3% of the overall NDWRCDP budget. Finally, there is a 3% contingency built into the budget, which will be programmed and expended as the USEPA/WUSTL cooperative agreement moves towards completion.

TRAINING, RESEARCH AND DEVELOPMENT PRIORITIES

The short and long-term research priorities of the NDWRCDP are listed on the NDWRCDP website at http://www.ndwrcdp.org/research.cfm and in the 2002-2003 NDWRCDP Training, Research and Development Plan which is available in a limited number of hard copies and for download from the NDWRCDP Research Priorities page of the NDWRCDP website.

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[2] The NDWRCDP Community Decision-Making Forum was held in Arlington, VA on July 28-29, 2004. The NDWRCDP Environmental Science & Engineering Forum was held in St. Louis, MO on October 19-20, 2004.

[3] Research management efforts by R. Ehrhard (EPRI-CEC) in his capacity as PSC Chair and subcommittee member are included in the WU & EPRI-CEC line item rather than the Research Management line item.

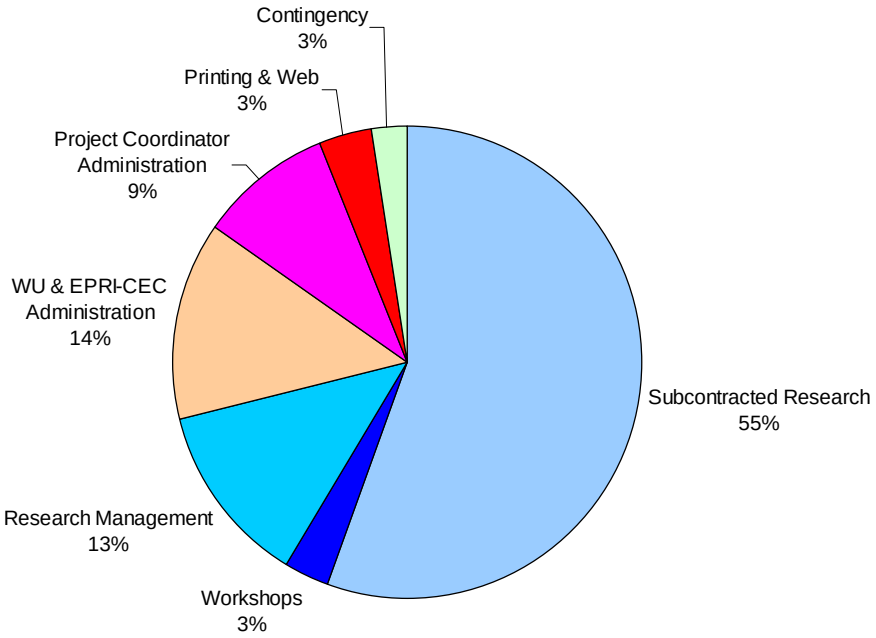


Figure 1. NDWRCDP budget by cost category.

Table 3. NDWRCDP budget by cost category and expenditures as of October 2004.

Budget Category	Budget ($1000's)	Budget (%)	Exenditures ($1000's)
Subcontracted Research			
- Environmental Science & Engineering	1,654		
- Management & Economics	1,138		
- Regulatory Reform	601		
- Training & Education	1,171		
Subtotal	**4,564**	**55**	**4,130**
Workshops (1)	**248**	**3**	**151**
Research Management (2)			
- Comm. Demo. Project Info. Exchange	150		
- Other (e.g., PSC/Sucomm time & expenses	878		
Subtotal	**1,028**	**13**	**730**
Administration - WU & EPRI-CEC (2)			
- WU indirect costs on research & admin. Subs	537		
- Other (e.g., staff time & expenses)	578		
Subtotal	**1,115**	**14**	**919**
Administration - Project Coordinator	**761**	**9**	**652**
Printing & Web	**284**	**3**	**135**
CY2005 Administration & Contingency	**210**	**3**	**0**
TOTAL	**8,210**	**100**	**6,717**

(1) includes Future Mapping workshop, Integrated Water Resources workshop, and two meetings of the subcontracted researchers (Community Decision-Making Forum and Environmental Science & Engineering Forum

(2) research management efforts by R. Ehrhard (EPRI-CEC) in his capacity as PSC Chair and subcommittee member are included in the WU & EPRI-CEC line item rather than the Research Management line item

NDWRCDP training, research and development priorities were developed primarily through synthesis of recommendations from two strategic planning efforts organized and sponsored by the NDWRCDP.

In May 2000, a research needs conference, “Risk-Based Decision Making for Onsite Wastewater Treatment” was convened by the NDWRCDP in St. Louis, Missouri. More than 200 public officials and experts had participated in one of three regional workshops, at the University of South Florida, the University of Rhode Island, and the University of Washington prior to the National Conference. Issues and concerns raised in these workshops led to a request for five separate white papers. These white papers, presented at the National Conference, focused on key areas of risk management and science in the onsite/decentralized wastewater field, and may be downloaded from the NDWRCDP website at http://www.ndwrcdp.org/research.cfm.

In March 2001, the NDWRCDP sponsored a two-day strategic retreat in Arlington, Virginia on the future of the decentralized wastewater industry. Thirty-five invited participants from around the country attended, including academics, USEPA officials, manufacturers, engineers, regulators, utility experts, and others with an interest in the field.

The goal of this retreat entitled “Mapping the Future of Onsite/Decentralized Wastewater Treatment” was to map alternative scenarios or endstates for how the field might evolve by 2010. A strategic consulting firm, Nervewire, Inc., was hired to facilitate the meeting and to implement its copyrighted scenario-building exercises called Future Mapping®. Working groups were formed to develop the driving forces and details of four different endstates, along with research recommendations appropriate to each scenario. A summary of this Future Mapping® exercise can be downloaded from the NDWRCDP website at http://www.ndwrcdp.org/research.cfm.

Input on the NDWRCDP training, research and development priorities was also incorporated from the National Community Decentralized Wastewater Demonstration Projects, as well as through communications with state onsite regulators and others. The summation of these inputs resulted in the list of priority research needs that has been described above in the NDWRCDP Training, Research, and Development Plan.

The National Community Decentralized Wastewater Demonstration Project was initiated by the U.S. Congress in the FY ’97 appropriations bill for the USEPA. In order to “jump start” the process of addressing the barriers to full utilization of decentralized alternatives identified in the 1997 USEPA Report to Congress, the FY’98 appropriation included a number of directed projects. The Congress authorized funding of several comprehensive, multi-faceted demonstration projects to be directly funded by USEPA, with which the NDWRCDP has established a Coordinated Information Exchange Program. This “Coordinated Information Exchange” with the demonstration projects assists the NDWRCDP in gaining an understanding of additional gaps in knowledge (needs) and/or implementation experience uncovered by the demonstration projects, promotes communications between the demonstration projects and the NDWRCDP,

and assists the demonstration projects in accessing state-of-the-art information and adapting it for local consideration.

SPONSORED PROJECTS

Key areas emphasized by projects funded by the NDWRCDP have included development of practitioner training and engineering curriculum materials, improved model state regulatory codes, better engineering design and decision support tools, and more effective processes and tools for community wastewater management decision-making.

The NDWRCDP has awarded funding to 29 projects. (See **Attachment A**.) There are nine projects that fall into the Environmental Science and Engineering category; 10 that fall into the Management and Economics category; five that fall into the Regulatory Reform category and five that fall into the Training and Education category. Sixteen projects have been completed to date. The remaining 13 projects are expected to be completed by the end of 2004 or early 2005.

OUTREACH

The NDWRCDP disseminates information concerning NDWRCDP activities and results of sponsored projects in a variety of ways. The NDWRCDP website at www.ndwrcdp.org is accessible to the public and includes information on the NDWRCDP mission; organization and management; training, research and development priorities; funding opportunities; sponsored projects; and related websites, news and events. Project reports prepared by the investigators upon completion of their NDWRCDP sponsored projects describe the research findings and are made available on the NDWRCDP website publications page and through the National Small Flows Clearinghouse.

The NDWRCDP has also sponsored exhibits at conferences of various decentralized stakeholders and practitioners, such as NOWRA, NEHA, and the ASAE Individual and Small Communities Sewage Systems Symposium, to publicize NDWRCDP activities and accomplishments. At these and other local, regional and national meetings attended by onsite and decentralized wastewater professionals, such as the Annual State Onsite Wastewater Regulators Conference, the NDWRCDP PC and PSC members make presentations on NDWRCDP activities. NDWRCDP project investigators are also encouraged to participate by providing presentations on their NDWRCDP-sponsored research and development projects. Beginning in 2004 this form of outreach was expanded to other conferences involving stakeholder groups that are either impacted by decentralized wastewater decisions or are directly responsible for making them.

A list of the various conferences in which the NDWRCDP has participated is included in **Table 4**.

Table 4. Conferences Participated in by NDWRCDP.

2000	
State Onsite Wastewater Regulators Conference	Denver, CO; June 13, 2000
Consortium of Institutes for Decentralized Wastewater Treatment Annual Meeting	Grand Rapids, MI; October 31, 2000
NOWRA Technical Exhibition and Conference	Grand Rapids, MI; November 1 – 4, 2000
2001	
ASAE Individual and Small Community Sewage Systems Symposium	Fort Worth, TX; March 11 – 14, 2001
SORA State Onsite Wastewater Regulators Conference	Washington, DC; April 17 – 20, 2001
Consortium of Institutes for Decentralized Wastewater Treatment Annual Meeting	Virginia Beach, VA; October 9, 2001
NOWRA Technical Exhibition and Conference	Virginia Beach, VA; October 10 – 12, 2001
2002	
Southwest Onsite Wastewater Management Conference and Exhibition	Laughlin, NV; March 6 – 7, 2002
SORA State Onsite Wastewater Regulators Conference	Newport, RI; March 20 – 23, 2002
Northwest On-Site Wastewater Treatment Short Course and Equipment Exhibition	Seattle, WA; April 1 – 2, 2002
Consortium of Institutes for Decentralized Wastewater Treatment Annual Meeting	Kansas City, MO; September 16, 2002
NOWRA Model Code Committee Meeting	Kansas City, MO; September 17, 2002
NOWRA Technical Exhibition and Conference	Kansas City, MO; September 18 – 21, 2002
WEF Technical Exhibition and Conference	Chicago, IL; September 28 – October 2, 2002
2003	
SORA State Onsite Wastewater Regulators Conference	North Las Vegas, NV; March 24 – 27, 2003
Northwest On-Site Wastewater Treatment Short Course and Equipment Exhibition	Seattle, WA; September 22 – 23,2003
WEF Technical Exhibition and Conference	Los Angeles, CA; October 11 – 15, 2003
NOWRA Model Code Committee Meeting	Franklin, TN; November 3, 2003
NOWRA Technical Exhibition and Conference	Franklin, TN; November 4 – 6, 2003
2004	
SORA State Onsite Wastewater Regulators Conference	Orlando, FL; February 22 – 27, 2004
NAHB National Green Building Conference	Austin, TX; March 13 – 16, 2004
ASAE Individual and Small Community Sewage Systems Symposium	Sacramento, CA; March 21 – 24, 2004
RCAC/RCAP National Rural Development Conference Showcase Exhibit	Portland, OR; March 22 – 24, 2004
APA National Planning Conference	Washington, DC; April 25 – 28, 2004
NACo Annual Conference and Exposition	Phoenix, AZ; July 16 – 20, 2004
NOWRA Technical Exhibition and Conference	Albuquerque, NM; November 7 – 10, 2004
Consortium of Institutes for Decentralized Wastewater Treatment Annual Meeting	Albuquerque, NM; November 10, 2004

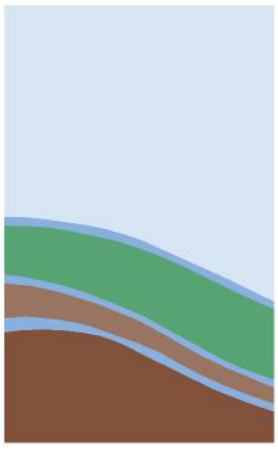
OTHER STRATEGIC PLANNING

In February 2002, the NDWRCDP co-sponsored a strategic retreat, “Distributed and Nonstructural Water and Wastewater Systems: Charting “Soft Paths” to Integrated Water Resource Management”. The retreat was facilitated by S. Christopher Associates. Participants included public policy and environmental advocates and experts in design of distributed storm water runoff impact minimization. Areas of expertise included low impact development practices that retain natural infiltration/treatment zones and distribute infiltration and bioretention throughout a development, use of agricultural stream buffers and other best management practices, and employment of soft-path flood control measures such as parkland stream buffers. These participants were mixed together with more conventional engineering advocates and decentralized wastewater experts.

Workshop participants discussed a range of environmental, economic, and community benefits that could result from decentralized and nonstructural approaches to water quality protection and integrated water resource management. They developed recommendations for reform of engineering practice, regulatory structures and management, and for research and demonstration projects. Detailed recommendations were made for reform of the water and wastewater financing systems, which in the past have favored centralized solutions.

These discussions were also intended to provide a framework for the expansion of training, research and development activities by the NDWRCDP, as it expands beyond wastewater into other sectors of decentralized and nonstructural water quality protection under the Cooperative Agreement between EPA and WERF. A summary of this workshop can be downloaded from the NDWRCDP website at the following URL: http://www.ndwrcdp.org/research.cfm.

ATTACHMENT A



National Decentralized Water Resources Capacity Development Project

Sponsored Projects

November 1, 2004

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ENVIRONMENTAL SCIENCE AND ENGINEERING

Cooperating Institution:	COLORADO SCHOOL OF MINES (*Final Project Report in press*)
Principal Investigator:	Robert Siegrist
Project Title:	Quantifying Site-Scale Processes and Watershed-Scale Cumulative Effects of Decentralized Wastewater Treatment Systems
Project Period:	Phase I - July 1, 2000 to June 30, 2002; Phase II - July 1, 2001 to September 30, 2004.
Project Budget:	Phase I - $320,006; Phase II - $307,494
Project Description:	This research was undertaken to enhance the quantitative understanding of site-scale processes affecting the performance of onsite wastewater systems (OWS) and to develop modeling tools that can describe and predict individual system performance and the cumulative effects of multiple systems on water quality within a watershed. To accomplish this goal, the project was designed and carried out in two phases by a collaborative team involving the Colorado School of Mines, Electric Power Research Institute, Systech Engineering, Inc., U.S. Geological Survey, and the Summit County Environmental Health Department including participation by a stakeholder group from the study area. The project scope included literature review and analysis, laboratory experimentation and field monitoring, and development and refinement of mathematical models and completion of site-scale and watershed-scale model simulations. Analysis of literature data was used to develop cumulative distribution functions of pollutant concentrations in domestic septic tank effluent and the rate and capacity parameters governing their transport/fate in a soil and ground water environment. Laboratory and field experimentation enhanced the understanding of biozone genesis and the transport/fate of microbes and chemicals in soil-based OWS. Modeling of individual OWS was completed using an existing numerical model, HYDRUS 2-D, and a new analytical model, the Biozone Algorithm. Literature data and experimental results enabled single site-scale model formulation, calibration, and testing. The OWS site-scale source/transport/fate expressions have been incorporated into an existing watershed model, the Watershed Analysis Risk Management Framework model (WARMF) that can be used for simulating the effects of OWS relative to other pollutant sources on water quality in a watershed or sub-watershed. The WARMF model as well as the BASINS/SWAT and MANAGE models were setup for the Dillon Reservoir watershed in Summit County, Colorado. In this watershed there are over 1000 OWS as well as other nonpoint and point sources of pollution, and over 600 onsite drinking water wells along with community wells and surface water supplies and Dillon Reservoir also provides 25% of the drinking water supply for the City of Denver. After setup and calibration, model simulations were completed to examine current wastewater management

scenarios and the simulation results were compared to field monitoring data. Examination of future wastewater management scenarios was also completed through watershed-scale model simulations (e.g., abandonment of OWS and connection to a centralized wastewater treatment plant).

Cooperating Institution:	OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
Principal Investigators:	Rodney Weick and Steve Hinkle
Project Title:	Coliphage Attenuation in Onsite Wastewater Treatment Systems, and Coliphage Transport in Receiving Ground Waters
Project Period:	October 1, 2002 to March 31, 2005
Project Budget:	$299,281
Project Description:	This research will expand upon the scope of work in the La Pine National Community Decentralized Wastewater Demonstration Project to include research on coliphage attenuation during on-site wastewater treatment, and on subsequent transport in ground water. This work will also be complemented by evaluating the suitability of common wastewater compounds as tracers of coliphage transport. Coliphage are viruses that infect and replicate in coliform bacteria, and are found in high concentrations in wastewater. Wastewater compounds of interest include a suite of 67 compounds typically found in domestic and industrial wastewater, including caffeine, cholesterol, menthol, camphor, cotinine (a nicotine metabolite), detergent metabolites, antimicrobial agents, disinfectants, antioxidants, and compounds originating from deodorants and fragrances. The research consistd of two components: (1) attenuation of coliphage in traditional and innovative onsite wastewater systems will be measured to provide information about the efficiency of coliphage removal during treatment of wastewater, (2) ground water contaminated with plumes of wastewater will be sampled at various points for coliphage and wastewater compounds to determine transport parameters for these analytes and to determine the suitability of wastewater compounds as surrogates for coliphage transport. The shallow water table and existing research infrastructure in the La Pine NDP study area present an ideal setting for studying transport of on-site wastewater-derived coliphage under natural gradient conditions. Furthermore, the existing infrastructure of the La Pine NDP study can be used to test the ability of innovative on-site wastewater systems to remove coliphage during wastewater treatment, and to test the usefulness of wastewater compounds as tracers of coliphage occurrence and transport.

Cooperating Institution:	COLORADO SCHOOL OF MINES (*Final Project Report in press*)
Principal Investigator:	Eileen Poeter
Project Title:	Hydrogeological Evaluations for Larger Cluster and High Density Wastewater Soil Absorption Systems
Project Period:	January 6, 2003 to October 31, 2004
Project Budget:	$89,100
Project Description:	This project has produced a report identifying and discussing appropriate hydrogeological investigations and analysis methods for siting and design of large cluster and high-density wastewater soil absorption systems. In addition to addressing field investigative methods, appropriate modeling tools and the costs and benefits associated with the various methods of investigation were examined. Case studies illustrating the appropriate application of investigation techniques and modeling approaches are provided.

Cooperating Institution:	NORTH AMERICAN WETLANDS ENGINEERING (*Project completed, Final Project Report not available from NDWRCDP*)
Principal Investigator:	Scott Wallace
Project Title:	Field Evaluations for Large Cluster Wastewater Soil Absorption Systems
Project Period:	June 15, 2003 to October 31, 2004
Project Budget:	$65,173
Project Description:	In 2002, the NDWRCDP funded a proposal submitted by the Colorado School of Mines (CSM) to evaluate the application of hydrogeologic models to WSAS designs. This project was intended to complement the ongoing CSM effort. Five large-scale WSAS systems were evaluated using a variety of field techniques. The objective of this effort was to determine the accuracy and applicability of the information gathered through different field techniques as applied to the problem of WSAS mounding. Actual mounding was measured; and different sets of field data were input into the models recommended by CSM as being appropriate for the hydrogeologic setting. However, due to limitations in the field sampling program, comparisons of model accuracy could not be performed. The appropriate use of various field techniques was assessed, but further research is recommended in this area to identify appropriate field investigation methods for assessing groundwater mounding potential.

Cooperating Institution:	LOMBARDO ASSOCIATES, INC. (*Final Project Report in press*)
Principal Investigator:	Pio Lombardo
Project Title:	Micro-Scale Evaluation of Phosphorous Removal: Part I. Phosphorus Geochemistry in Soils Handbook
Project Period:	June 1, 2003 to October 30, 2004
Project Budget:	$49,840
Project Description:	The objectives of this project was to document the current understanding of phosphorus (P) geochemical processes and address: (1) sources of P; (2) soil removal mechanisms for the Removal of P;(3) site conditions that adversely impact P removal; (4) P removal under saturated soil conditions; and (5) long-term P removal at locations subject to high hydraulic loading associated with cluster systems or high density individual systems, as well as revise the Research Project Identification developed by Gold and Sims (2000) by: (1) updating and/or revising the research needs presented by Gold and Sims; (2) identifying new needs; and then (3) prioritizing the integrated list. These objectives have been realized through the preparation of a Phosphorus Handbook, with an Appendix containing the Research Project Identification. This project represents one component of a larger effort that is required to further the understanding of phosphorus issues and solution alternatives in the decentralized wastewater field. The final deliverables will provide information and guidance to a target audience of professionals involved in planning, design, construction, management and regulation of decentralized (focusing on on-site and cluster) wastewater management systems, who are involved in implementing WSAS in P sensitive areas.

Cooperating Institution:	STONE ENVIRONMENTAL, INC. (*Draft Final Project Report received*)
Principal Investigator:	Carl Etnier
Project Title:	Micro-Scale Evaluation of Phosphorus Removal: Part II. Alternative Wastewater Systems Evaluation
Project Period:	June 1, 2003 to December 31, 2004
Project Budget:	$55,000
Project Description:	Understanding and managing sources of phosphorus pollution in the landscape necessitates evaluating and minimizing the P contribution from onsite systems to surface waters. The project team will report on phosphorus removal technologies that have been proposed and/or tested for use in decentralized wastewater treatment. The report will include information about the application, performance, cost-effectiveness, and other factors associated with each technology. The report will examine a range of phosphorus-removal technologies, including source reduction, source separation, septic tank treatment, secondary treatment technologies, and soil absorption system design. The alternatives selected will be evaluated with a set of criteria including removal capability, cost, system robustness, secondary benefits, maintenance

requirements, and costs. A list of prioritized research needs will be developed based on review of work conducted since the review by Gold and Sims (2000) as well as earlier literature not considered by the authors, and an integrated list including the needs identified by Gold and Sims will be produced. The project team includes nationally and internationally recognized experts in phosphorus removal and in onsite wastewater treatment technologies.

Cooperating Institution:	COLORADO SCHOOL OF MINES
Principal Investigator:	Robert Siegrist
Project Title:	Field Performance Evaluation of Engineered Pretreatment Units and Their Effects on Biozone Formation in Soils and System Purification Efficiency
Project Period:	July 1, 2003 to January 31, 2005
Project Budget:	$199,221
Project Description:	To further increase the understanding and advance the standard of practice for application of advanced pretreatment for onsite wastewater systems, controlled but representative experimentation must be completed. This project will use proven methodologies involving existing research facilities and apparatus to enable detailed characterization of the effluent quality produced by three different levels of pretreatment (septic tank, septic tank with textile filter unit, and a membrane bioreactor) and the effects of these effluent qualities on the genesis of an *in situ* biozone and the hydraulic and purification performance of a soil treatment system. The research will also address the matter of performance monitoring of engineered units and soils systems with respect to methods and frequency of measurements. The proposed research will be completed by a team of faculty, staff and students at the Colorado School of Mines (CSM) and will be enabled by CSM's existing facilities and an ongoing research program. The research will be completed using replicated and instrumented, field pilot-scale unit operations installed at the Mines Park Test Site located on the CSM campus. The results of the work will directly support guidance regarding when and how to apply increasing levels of pretreatment to cost-effectively treat wastewater at a given site.

Cooperating Institution:	DESCHUTES COUNTY ENVIRONMENTAL HEALTH
Principal Investigators:	Roger Everett and Dave Morgan
Project Title:	Application of Simulation-Optimization Methods to Development of Risk-Based Management Programs for Communities using Decentralized Wastewater Systems
Project Period:	July 1, 2003 to January 31, 2005
Project Budget:	$92,777
Project Description:	This project will evaluate various optimization techniques with respect to their applicability to development of risk-based management programs in communities utilizing decentralized wastewater treatment.

Simulation models can be expensive to develop, largely because they require more data than some other techniques, such as mass balance calculations. However, where simulation models are justified due to the complexity of the groundwater system and need for predictive capability, the use of optimization can actually reduce the cost of using the simulation model to identify best management strategies. It should be noted that the simulation models are available for many communities, and even if they were initially developed for other purposes, can often be cost-effectively adapted to address water quality issues. This research is important because it will demonstrate how the simulation-optimization approach can be applied to a new class of resource management problem—identifying the optimal distribution and rate of non-point source loading that achieves groundwater quality protection goals and land-use objectives. The objective of this project is to develop a practical, cost-effective method of using distributed nitrogen transport models with optimization techniques to support risk-based decision making and management of water quality. The project will produce a technical report that describes the method and provides guidance on application to other areas.

Cooperating Institution:	WASHINGTON UNIVERSITY IN ST. LOUIS
Principal Investigators:	Daniel Giammar and Lars Angenent
Project Title:	Evaluation of Chemical and Biological Tracers for Source Apportionment of Phosphorus in Table Rock Lake, on the Missouri-Arkansas Border
Project Period:	November 1, 2003 to April 30, 2005
Project Budget:	$263,382
Project Description:	Preserving the water quality of freshwater lakes requires protection from excessive loading of the nutrients nitrogen and phosphorus. In many lakes, phosphorus is the limiting nutrient. Phosphorus inputs to lakes include both point and non-point sources. Phosphorus inputs from point sources can be regularly monitored and controlled at a single location, but phosphorus loadings from non-point sources are more difficult to quantify and control. Centralized wastewater treatment facilities are the largest potential point source, and non-point sources include decentralized wastewater treatment systems as well as agricultural and urban runoff. Although phosphorus may be retained in the leach fields of properly functioning septic systems, phosphorus can be highly mobile from poorly functioning or non-functioning septic systems. Apportionment of phosphorus loadings to multiple sources is currently accomplished using a combination of direct measurements of point sources and estimations of non-point source contributions based on land use distributions. A complementary apportionment approach could involve the measurement of certain chemical and biological species as tracers. Useful tracers would be present in different sources with unique relative concentrations (source signatures), and useful tracers must also

meet requirements regarding reproducibility, specificity to source type, and stability with respect to transport and degradation. The proposed project will evaluate the utility of select chemical and biological species for phosphorus source apportionment within the context of Table Rock Lake on the Missouri-Arkansas border. The proposed project will evaluate three classes of potential tracers: 1) trace elements, 2) synthetic organic chemicals, and 3) biological species. The investigation will combine direct sampling of waters from potential phosphorus sources with sampling of surface waters likely to have been predominantly impacted by a single type of source (source-rich surface waters). The project will focus on four potential phosphorus sources: 1) centralized wastewater treatment plants, 2) decentralized wastewater treatment systems, 3) runoff of animal wastes from feeding operations or fields to which wastes were applied, and 4) runoff of inorganic phosphate fertilizers. The sampling and analysis activities will generate a large dataset that will be evaluated for data quality and analyzed to identify the most useful tracers. The determination of useful tracers can provide a complementary approach to current source apportionment methods that are based on land use, and such an approach can have impacts far beyond the context of Table Rock Lake.

MANAGEMENT AND ECONOMICS

Cooperating Institution:	TOWN OF TISBURY, MASSACHUSETTS (*Final Project Report available*)
Principal Investigator:	Dennis Luttrell
Project Title:	Developing a Risk-Based Management Program for Water Quality Protection in Tisbury, Massachusetts
Project Period:	July 1, 2000 to May 31, 2002
Project Budget:	$94,495
Project Description:	The Town of Tisbury developed a Community Wastewater Management Plan (CWMP) to provide for comprehensive management of approximately 2,400 septic systems in the Town. NDWRCDP support was provided to the Town to assist them in performing an environmental risk assessment of Tisbury's water bodies and groundwater, and for the development of a risk-based management program for decentralized wastewater systems. This project involved the characterization of environmental impacts from existing systems, and development of a water quality protection strategy incorporating performance-based standards and application of alternative wastewater treatment technologies and cluster designs according to the sensitivity of the receiving environment.

Cooperating Institution:	UNIVERSITY OF RHODE ISLAND COOPERATIVE EXTENSION (*Final Project Report available*)
Principal Investigator:	Lorraine Joubert
Project Title:	Creative Community Design and Wastewater Management
Project Period:	July 1, 2000 to January 31, 2004
Project Budget:	$74,022
Project Description:	In partnership with a planning and design firm, URI developed a guidance manual for local officials to demonstrate the use of alternative on-site wastewater treatment technologies to support zoning for compact and sustainable land use patterns. The manual compares standard development layouts using conventional septic systems with creative land use development patterns using alternative on-site wastewater technologies, and addresses issues such as construction costs, maintenance needs, visual impact, extent of land disturbance, and environmental impacts. The project includes use of selected unsewered sites in southern Rhode Island to illustrate compact design options and application of alternative on-site wastewater options available to support the compact unsewered development.

Cooperating Institution:	UNIVERSITY OF RHODE ISLAND COOPERATIVE EXTENSION (*Final Project Report available*)
Principal Investigator:	Lorraine Joubert
Project Title:	Wastewater Management Planning Handbook: Mapping Onsite Treatment Needs, Pollution Risks and Management Options Using GIS
Project Period:	May 1, 2001 to December 10, 2003
Project Budget:	$87,028
Project Description:	This project developed guidance for small communities on use of computer-generated maps and other databases for wastewater management planning. The report synthesizes methods used by the University of Rhode Island Cooperative Extension for risk-based assessment of watersheds and aquifer recharge areas. The focus is on relatively low-cost screening-level analysis, using available databases to target high-risk pollution sources. The handbook employs practical examples from several community-based assessments to describe both the methods used and the process of involving local decision-makers in the assessment. A secondary objective was to review and summarize similar assessment methods using Geographic Information Systems (GIS) for data collection and analysis, focusing on wastewater needs assessment applications. The intended audience for the handbook includes community leaders, local planners, and resource managers faced with making land use and wastewater management decisions.

Cooperating Institution:	OAK RIDGE NATIONAL LABORATORY (*Final Project Report in press*)
Principal Investigator:	Dan Jones
Project Title:	Integrated Risk Assessment for Individual On-Site Wastewater Systems
Project Period:	September 15, 2001 to September 30, 2004
Project Budget:	$200,024
Project Description:	This project comprised the first phase needed to develop a comprehensive risk-based decision-making approach for onsite/decentralized wastewater treatment and management. The project produced a general risk-based framework for integrating the results from four different types of assessments into a single cohesive risk assessment framework for individual onsite wastewater treatment systems. Risk is implicitly included in current permitting regulations for onsite wastewater treatment systems. However, estimation of explicitly defined risks associated with such rules has not been accomplished, due primarily to the lack of a standardized method for integrating disparate risks into a comprehensive approach that can be applied at various sites and geographical scales. The types of component risk assessments that are addressed include engineering, ecological, public health and socioeconomic. The general framework consists of problem formulations for individual systems, a component framework for each type of assessment, an approach to integrating the results of each

component assessment, and a brief discussion of risk management issues.

Cooperating Institution: SAN FRANCISCO PUBLIC UTILITIES COMMISSION, BUREAU OF SYSTEM PLANNING, ENVIRONMENT AND COMPLIANCE (*Final Project Report in press*)
Principal Investigator: Gregg Olson
Project Title: Decentralized Wastewater Treatment within San Francisco's Centralized Combined Sewage System: Hunters Point Shipyard Site Specific Study
Project Period: September 1, 2001 to May 31, 2004
Project Budget: $75,000
Project Description: The feasibility of a decentralized wastewater treatment plant in the former Hunters Point Naval Shipyard redevelopment area, intended to supply effluent to a storm water treatment wetland during the dry months and to satisfy other recycled water needs of the area, was studied in this project. The study was conducted by a consultant, and managed by the Public Utilities Commission in cooperation with community and environmental groups represented by the Alliance for a Clean Waterfront. Oversight and review was provided by the San Francisco Public Utilities Commission's technical review committee, which includes academic experts in alternative treatment technologies, including George Tchobanoglous and David Jenkins. The project began with the solicitation of public input. Projected wastewater flows and recycled water demands were quantified and characterized. Issues concerning siting of the plant and treatment technology were identified and addressed, and a cost/benefit analysis was completed. Detailed explanations of the technical aspects of the approach are provided and the financial, regulatory, management, and community concerns and their roles in the evaluation of alternatives are described. It is anticipated that this work will serve as a template for future work to be done in other developments within San Francisco, and it will be useful to other communities around the country in their efforts to develop less centralized and more environmentally beneficial wastewater treatment systems.

Cooperating Institution: LOMBARDO ASSOCIATES INC. (*Final Project Report available*)
Principal Investigator: Pio Lombardo
Project Title: Planning and Management of Cluster Wastewater Systems
Project Period: October 1, 2001 to March 31, 2004
Project Budget: $148,538
Project Description: The objective of this project was to provide guidance to engineers, utilities, and communities on the management, technology, operation and maintenance, financing, land-use planning, and regulatory aspects of cluster systems. In the context of on-site/decentralized wastewater treatment systems, a cluster system consists of two or more individual

residences or other facilities that have a common collection network and place of re-use or re-use/dispersal at or near the point of wastewater generation. Case studies are provided describing successful examples in areas of the country differing in climate, soils, and regulatory frameworks. Innovative solutions to financing, management, private property easements, and telemetry are described.

Cooperating Institution:	ROCKY MOUNTAIN INSTITUTE (*Final Project Report in press*)
Principal Investigators:	Joel Swisher and Richard Pinkham
Project Title:	Case Studies of Economic Analysis and Community Decision-Making for Decentralized Wastewater Treatment
Project Period:	December 1, 2001 to October 30, 2004
Project Budget:	$127,579
Project Description:	This project increases understanding of how communities consider and value the benefits and costs of different scale wastewater facility options (onsite, cluster, and centralized options) in dollar or other terms, and examine the driving issues, motivations, thought processes and decision-making methods of stakeholders relative to choices of wastewater system scale. Nine case studies covering seven specific topics that have received little or no attention in the literature to date were developed. The topics addressed include (1) financial benefits of incremental capacity expansion through implementation of decentralized systems; (2) impacts of wastewater system choices on community growth, development, and autonomy; (3) hydrologic impacts of wastewater systems; (4) implications for fairness and equity within communities; (5) how communities evaluate reliability, vulnerability, and resilience of wastewater systems; (6) the role of wastewater facility decision-making processes in developing positive image and trust in stakeholder/public relationships; and (7) the value of decentralized systems to sanitation utilities that already manage large centralized systems. The investigations seek both quantitative and qualitative economic and social process information. The research products include case study synopses and integration of the case study findings into a research report Rocky Mountain Institute is now developing for the U.S. Environmental Protection Agency. That report is a “catalog” of all issues with potential economic implications that do or should arise as communities choose between centralized or decentralized options for wastewater systems, or that follow from a community’s choices. The report will summarize what is known in the existing literature about the economics of each issue and discuss techniques available to put economic values on the benefit or cost each issue presents to communities for different wastewater system choices. The information developed in this research will enable the NDWRCDP to refine its education and training programs, and will support NDWRCDP efforts to assess the economics and improve the management of decentralized wastewater systems.

Cooperating Institution:	PRIMEN, INC. (*Final Project Report available*)
Principal Investigator:	Shawn McNulty
Project Title:	Evaluating Customer Response to Decentralized Wastewater Treatment Options
Project Period:	October 1, 2002 to April 30, 2003
Project Budget:	$27,954
Project Description:	This project explores stakeholder attitudes that serve to shape responses to decentralized wastewater treatment technologies (DWTT) and wastewater system management options. The work represents an attempt to leverage an existing data resource that may provide a reasonable set of initial answers to questions about customer response to both DWTT and system management options. Analysis of this existing data resource provides some insight into "where potential customers are now" on issues of the acceptance of decentralized technology options and innovative system management options, but also provides initial information about how customers might be moved to be more receptive to such options in the future. Prior research and analysis on the subject of market penetration paths for decentralized wastewater treatment systems points to an uncertain future. While technology advances have been made, and customer interest has started to pick up, there is still enough uncertainty in terms of demonstrable technology performance, customer and regulatory acceptance, the impact of other interest group activities and agendas, and other issues, that the rate of increase at which DWTT, cluster systems, and innovative wastewater system management options will be adopted – and the timeline and market segments, along which these options will be implemented – is a very open question. While there are market scenarios that point to the possibility of relatively widespread adoption of DWTT within a reasonable time frame, the confluence of forces necessary to yield this outcome has not yet come together. One of the real unknowns in understanding both the likelihood of this outcome, and understanding how best to intervene in ways that enhance the desired outcome, is the real situation of potential customers. A variety of anecdotal evidence and small scale surveys suggest that customers (except those in special circumstances) tend to oppose the idea of DWTT under most conditions. Whether this view is accurate as a description of potential customers as a whole is an open question, however, as is a clear understanding of how to structure a DWTT product or service, including new system management options, in a way that is most attractive to potential customers, while still offering value to providers.

Cooperating Institution:	OCEAN ARKS INTERNATIONAL (*Final Project Report received*)
Principal Investigator:	Barton Kirk
Project Title:	Evaluation of Methodologies for Comparison of Wastewater Treatment Options
Project Period:	June 15, 2003 to November 30, 2004
Project Budget:	$58,685
Project Description:	Present methods used in the U.S. for evaluating the consequences of wastewater treatment systems are primarily economic or only take into account the effect of effluent on receiving waters. As a result, the true environmental and social costs of wastewater treatment are often not included in decision-making. Many communities face decisions regarding centralized versus decentralized wastewater treatment as well as numerous strategies and technologies available within the centralized and decentralized sectors. This project is evaluating analytical tools and methods that have the potential to capture the environmental consequences of wastewater alternatives in non-monetary units. Methods evaluated include life cycle assessment (LCA) and associated software, environmental impact assessment (EIA), exergy evaluation, and the Sustainability Process Index (SPI). The models are evaluated in the context of several common scenarios of wastewater treatment decisions in the U.S. Criteria used to evaluate each tool include data availability, ease of use, capture of relevant environmental, economic, and social factors, and interest and usefulness of the information to decision makers. The specific objectives of this project are to explore the advantages and disadvantages of each tool, describe the barriers for use in the U.S., recommend models to be used in various wastewater treatment decision scenarios, and describe and prioritize the steps and costs to completing analyses.

Cooperating Institution:	STONE ENVIRONMENTAL, INC.
Principal Investigator:	Scott Johnstone
Project Title:	Decentralized Wastewater System Reliability Analysis
Project Period:	September 25, 2003 to December 31, 2004
Project Budget:	$245,000
Project Description:	Decentralized systems are a permanent part of the wastewater infrastructure, and understanding what works to improve their performance is crucial to allocating scarce resources to hardware and management. Performance may be evaluated against engineering, ecological, public health, and socioeconomic goals. Asset management represents a way to evaluate the effects of different management approaches on performance. A broad approach to asset management strategies will give the greatest insights into which management approaches are most successful at keeping costs down while improving performance with respect to other goals, as well. The overall objective of this project is to produce an easily understood, detailed handbook

addressing reliability of decentralized wastewater systems, life cycle costs and asset management that will be useful to public and private agencies, utilities, decentralized service providers, and regulatory and policy workers. To accomplish this, the project will: (1) evaluate alternative methodologies for reliability and life-cycle costing in the decentralized wastewater sector; (2) identify the available data and the data needed for the use of these methodologies in a statistically valid manner; (3) outline a broader asset management approach to customer service, operations and maintenance, and risk management; (4) recommend subsequent research projects required in the field, and possibly new methods or tools for use in reliability or life-cycle analysis; and (5) incorporate case studies to illustrate the models and tools' value and how they would be used.

REGULATORY REFORM

Cooperating Institution:	ENVIRONMENTAL RESEARCH INSTITUTE OF THE STATES (*Project completed; Final Project Report not available from NDWRCDP*)
Principal Investigator:	Carol Leftwich
Project Title:	State Authorities and Practices Regarding Management of Wastewater Systems
Project Period:	June 1, 2000 to December 31, 2002
Project Budget:	$162,405
Project Description:	ERIS worked with State water officials and program managers, State and local public health officials, and their representative organizations to develop baseline data on existing state and local wastewater authorities and programs, regulations, and environmental and public health responsibilities. This baseline information was compiled in a status report that is intended to assist EPA, the states, and local governments in determining ways to improve accountability, and intergovernmental and interagency coordination, and facilitate more comprehensive analyses of wastewater needs that may further efforts to improve water quality. The report is available through the Environmental Council of the States.

Cooperating Institution:	CALIFORNIA STATE UNIVERSITY AT CHICO (*Final Project Report in press*)
Principal Investigator:	Tibor Banathy
Project Title:	California Model Ordinance for Onsite Sewage Treatment and Management
Project Period:	July 1, 2000 to June 30, 2004
Project Budget:	$152,035
Project Description:	Initially, the objective of this project was to develop a model local ordinance for onsite wastewater treatment and management in California that could be adopted by local implementing agencies throughout the State thereby promoting uniformity of standards statewide. The project enlisted the resources of a team of technical experts to design and develop the ordinance. This team consisted of experienced persons from the private sector, regulatory sector and academia. The draft model ordinance was intended to be policy oriented, and make use of science-based principles to establish criteria for locating, designing, installing, inspecting, operating, maintaining, and monitoring onsite systems, with the goal in mind that the criteria would enable system evaluation and approval based on treatment goals and performance standards. With the passage of AB 885 in California, which called for the development of statewide standards for onsite wastewater treatment systems, the efforts of this project were redirected to contributing to development of the statewide regulations. This project has created a draft of the model local ordinance, which has been circulated for input from a variety of

stakeholders, but this document will not be finalized until the AB 885 regulations have been developed. The project deliverables for this project instead include a draft of the model local ordinance, and an evaluation of the statewide AB 885 regulatory development process in which the Director of the California Wastewater Training and Research Center at CSU-Chico has been a participant since the inception of the process.

Cooperating Institution: CHASE ENVIRONMENTAL SERVICES, INC
(*Final Project Report in press*)
Principal Investigator: Paul Chase
Project Title: Onsite Wastewater Regulator Outreach and Coordination Project
Project Budget: $80,000
Project Period: March 1, 2001 to July 31, 2004
Project Description: Chase Environmental Services, working with the National Small Flows Clearinghouse and the State Onsite Regulators Alliance, established a communication link between the NDWRCDP Project Steering Committee (PSC) and the regulatory community in order to keep the regulatory community informed of new developments in the decentralized wastewater field as a result of NDWRCDP efforts, and to obtain timely input from the regulatory community to assist the PSC in planning program activities. Activities include presentations on the NDWRCDP projects and activities and facilitated discussions between state regulators and NDWRCDP PSC members at the 2001, 2002, 2003 and 2004 National State Onsite Wastewater Regulators Conferences, an investigation of the feasibility of a national round table conference that would include the NDWRCDP, national wastewater related associations, the onsite wastewater regulatory community, and other related organizations, and ongoing interactions with the NSFC State Regulators Advisory Committee to obtain feedback on NDWRCDP research objectives and project progress.

Cooperating Institution: NATIONAL ONSITE WASTEWATER RECYCLING ASSOCIATION
(*Project completed; Final Project Report not available from NDWRCDP*)
Principal Investigators: Linda Hanifin Bonner and Michael Corry
Project Title: An Assessment of Performance Code Development and Production of Matrices Relating Soil Characteristics to Onsite and Decentralized Wastewater Treatment Systems
Project Budget: $110,850
Project Period: July 1, 2002 to June 30, 2004
Project Description: The primary goal of this project was to develop a framework for creating matrices defining the treatment contributions of soil components for onsite wastewater systems. These matrices are an essential component of the model performance code under development by NOWRA, and will be used to assist designers and regulators in determining pre-treatment components in the wastewater system treatment train necessary to

achieve established performance goals. Another project objective was to identify and report on the level of activity involving the development of performance codes for onsite systems throughout the states. The focus here was to determine the extent of the efforts of the states and organizations involved in model performance code activities, and the actions needed to gain the acceptance and support among the state and municipal officials to use a performance-based approach to make decisions to approve the location of onsite and decentralized wastewater treatment systems. A white paper detailing the results of this effort may be obtained from NOWRA.

Cooperating Institution:	NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION (*Draft Final Project Report received*)
Principal Investigator:	Tom Groves
Project Title:	Variability and Reliability of Test Center and Field Data: Definition of Proven Technology from a Regulatory Viewpoint
Project Period:	July 1, 2003 to December 31, 2004
Project Budget:	$96,000
Project Description:	On-site regulators and regulatory technical review panels across the country are evaluating a growing number of manufacturers' requests for technology approvals. Technical support documentation for product approval submittals from manufacturers range from peer reviewed journal articles with attached third party research reports to simple claims that "our system works just like Product X's system that you already approved" with little (or no) supporting third party research. Test centers and demonstration projects have been and continue to be initiated throughout the country without a comprehensive assessment and national consensus regarding how much and what quality of data is necessary for decision-making regarding what constitutes a "proven technology." This project will develop statistical relationships between the various types of data sets, provide a decision support system that integrates test center and field data to correctly predict field performance, and provide the regulatory and manufacturing communities with common sense guidance regarding how much data of what quality is needed to accept a technology as "proven." As the onsite program and industry moves towards a performance-based code and approach, this research will provide a baseline understanding on how to assemble, assess and interpret new and existing data sets to maximize their benefit to the onsite program.

TRAINING AND EDUCATION

Cooperating Institution:	NORTH CAROLINA STATE UNIVERSITY (*Final Project Report received*)
Principal Investigators:	David Lindbo
Project Title:	Model Decentralized Wastewater Practitioner Curriculum
Project Period:	February 1, 2001 to November 30, 2004
Project Budget:	$477,540
Project Description:	The objective of this project, directed by the Consortium of Institutes for Decentralized Wastewater Treatment, was to develop a model decentralized wastewater field practitioners training curriculum for use throughout North America. The curriculum consists of a series of noncredit short courses organized similar to a college curriculum. The primary topics that the curriculum address include: 1) planning/basic issues, 2) soil and site evaluation, 3) technologies, 4) design and engineering, 5) installation, construction and inspection, 6) operation and maintenance, and 7) troubleshooting and repair. High priority subtopics in four of the seven topical areas of the curriculum will be selected for full development of detailed training modules including trainer's guides and audio-visual educational materials. These will form the foundation of the basic curriculum and include: 1) soil and site evaluation, 2) water movement and treatment in soils, 3) decentralized technology overview and 4) septic tanks. The project is enhancing Consortium communications and distribution of information via a Consortium-wide electronic web developed to facilitate the development, assessment and electronic delivery of these training materials and their distribution to trainers who will deliver the training to the end-users. Subcontractors leading substantial parts of the project include the University of Minnesota, Washington On-Site Sewage Association, Michigan State University, Dalhousie University and other Consortium delegates.

Cooperating Institution:	UNIVERSITY OF ARKANSAS (*Final Project Report received*)
Principal Investigators:	Mark Gross
Project Title:	University Curriculum Development for Decentralized Wastewater Management
Project Period:	February 1, 2001 to November 30, 2004
Project Budget:	$380,996
Project Description:	This project involved a coordinated effort between universities and participants to develop curriculum materials for decentralized wastewater management. The goal of this project was to develop modules for a one-semester laboratory and field practicum in on-site and decentralized water and wastewater treatment and natural systems for water reclamation. The deliverables from this effort are modules in CD-

ROM format that can be used by instructors in environmental engineering and environmental studies programs. The vision for the project was to produce modules in a format appropriate for developing a full semester course, but in such a manner that the modules could be integrated into traditional courses currently being taught at 4-year institutions. The course materials include an approach to watershed issues and guidance for design of decentralized collection, treatment, and reuse systems. Subcontractors leading substantial parts of the project include Texas A&M University, California State University at Chico, Northern Arizona University, Michigan State University, and the University of Washington.

Cooperating Institution: GREEN MOUNTAIN INSTITUTE FOR ENVIRONMENTAL DEMOCRACY
(*Final Project Report available*)

Principal Investigators: Kenneth Jones

Project Title: A Status of Tools and Support for Community Decentralized Wastewater Solutions

Project Period: February 1, 2002 to May 31, 2003

Project Budget: $93,500

Project Description: The Green Mountain Institute for Environmental Democracy (GMI), in partnership with the Education and Training Subcommittee of the National Decentralized Water Resources Capacity Development Project (NDWRCDP) organized and facilitated two regional workshops in support of the National Decentralized Water Resources Capacity Development Project (NDWRCDP). These two workshops convened experts working on decentralized wastewater projects and service providers that work with communities to address their wastewater needs. The goal of these workshops was to learn what kinds of tools are needed to help assistance providers to more effectively communicate wastewater management options such as centrally-managed decentralized systems to communities facing wastewater problems; what existing decentralized wastewater systems tools and risk-communication materials are presently available for water/wastewater issues; how these organizations work to effectively help communities address environmental problems; what factors affect community consideration of decentralized wastewater management options; and what issues influence community decision-making and the decision-making process. In addition, the service providers learned more from ongoing demonstrations and national experts about decentralized wastewater systems, making them better advocates for the technology. Finally, these meetings provided the opportunity for attendees to form a stronger network of practitioners in the community-based environmental decision-making field, allowing future work products of the NDWRCDP and other sponsors to be more readily disseminated and incorporated into effective implementation-assistance products.

Cooperating Institution:	UNIVERSITY OF ARIZONA
Principal Investigators:	Kitt Farrell-Poe
Project Title:	Student Design Competition for Decentralized Wastewater Treatment
Project Period:	December 1, 2001 to December 31, 2004
Project Budget:	$70,220
Project Description:	The goal of this project is to develop, organize, and conduct a student design competition for decentralized wastewater treatment. The National Decentralized Water Resources Capacity Development Project is providing seed money and support to begin the competition. Once the competition is developed, other sources of funding and support – such as the U.S. EPA, NOWRA, private donations from manufacturers, etc. – will be solicited to sustain future competitions. The overall objective is to provide a forum for bringing young professionals into the field of decentralized wastewater treatment in an effort to overcome the "Lack of Knowledge and Public Misperception" barrier noted in the U.S. EPA *Response to Congress on Use of Decentralized Wastewater Treatment Systems*. The competition is designed in a manner to promote multi-disciplinary teamwork, enhance students' awareness of aspects of community and small-scale wastewater treatment in a watershed context, and embrace professional cooperation between engineering, soil science, hydrology, watershed science, communications, and public policy disciplines.

Cooperating Institution:	GREEN MOUNTAIN INSTITUTE FOR ENVIRONMENTAL DEMOCRACY (*Final Project Report received*)
Principal Investigator:	Kenneth Jones
Project Title:	Expanding Communication in Communities Addressing Wastewater Needs
Project Period:	June 1, 2003 to October 31, 2004
Project Budget:	$149,003
Project Description:	The Green Mountain Institute for Environmental Democracy in partnership with the Gund Institute for Ecological Economics and the Rocky Mountain Institute are developing products that will improve the participation of community members in making wastewater decisions. These products include: (1) fact sheets that describe the impacts of wastewater on health, environment and the economy; (2) a rapid assessment process to gather local information for the purpose of roughly characterizing current wastewater conditions; (3) scenarios that will promote discussion and build a better understanding of local wastewater issues; (4) a starter's kit including specific steps to initiate a process for solving community wastewater needs; (5) a process guide to assist service providers in utilizing the tools for any target community. In order to develop these products, the project team will pilot them in at least two Vermont communities and seek at least one additional

community outside of New England. These communities are early in the process of understanding their wastewater needs and will therefore be good testing grounds to determine how a collection of tools will promote discussion and understanding about wastewater and wastewater management. After the field tests, the project team will meet with several service providers to review the products and their pilot applications. The result of this meeting will be to refine the products and identify candidate locations for final testing. The final step in the project is for one or more service providers to test the products in communities where they serve. The result will be some refined tools and a stronger network of practitioners that can work with communities around the country to build local understanding of wastewater issues and the role of decentralized solutions in improving local water quality conditions.

PLANNING AND OUTREACH

USEPA DECENTRALIZED WASTEWATER COMMUNITY DEMONSTRATION PROJECTS

NDWRCDP Project Steering Committee (PSC) members have been appointed to Information Exchange Teams established for each EPA Community Onsite Wastewater Demonstration Project. The Teams are interacting with the EPA-funded Community Demonstration Projects to (1) promote communications and information exchange among the Community Demonstration Projects, and between the Demo Projects and the NDWRCDP; (2) perform limited technical transfer to benefit the Demo Projects; and (3) gain an understanding of the gaps in knowledge that these Demo Projects uncover to assist the PSC in defining program objectives for future NDWRCDP research, development and training activities.

MAPPING THE FUTURE OF ONSITE/DECENTRALIZED WASTEWATER TREATMENT

The NDWRCDP with assistance from Nervewire, Inc. convened a two-day, highly interactive strategic planning retreat in March 2001, using Nervewire's Future Mapping® process, to discuss possible future scenarios for development of the decentralized wastewater industry. The objectives of the workshop were (1) to explore alternative visions for how the onsite/decentralized field may evolve; (2) to gain a better understanding of the assumptions and reasoning of colleagues addressing wastewater challenges from different perspectives; (3) to discover and validate high level generalizations about how the various forces affecting wastewater policy and practice will interact; (4) to develop and sharpen the set of researchable or answerable questions which could have the greatest impact on the field if the answers were generally known and accepted; and (5) to consider and recommend strategies for publicizing information about wastewater alternatives and facilitating useful dialogue among practitioners, decision-makers, and the public. The results of this workshop have been used to help develop a framework for the research agenda that is driving NDWRCDP funding decisions in Round 2 and subsequent rounds of federal appropriations.

INTEGRATED WATER RESOURCES STRATEGIC PLANNING WORKSHOP

The NDWRCDP with assistance from S. Christopher Associates convened a two-day, highly interactive workshop on February 19-20, 2002 on Soft Path approaches to water resource protection and management. This workshop was intended to capture the best thinking about the application of Soft Path approaches both today and in the future. The workshop was attended by 36 thought leaders representing various sectors of the water resource management field (i.e., decentralized wastewater, distributed storm water, low-impact development, non-structural flood control, and other sectors). The principal goals of the workshop were to help participants: 1) develop a long-term vision for the future of distributed/ decentralized water management; and 2)

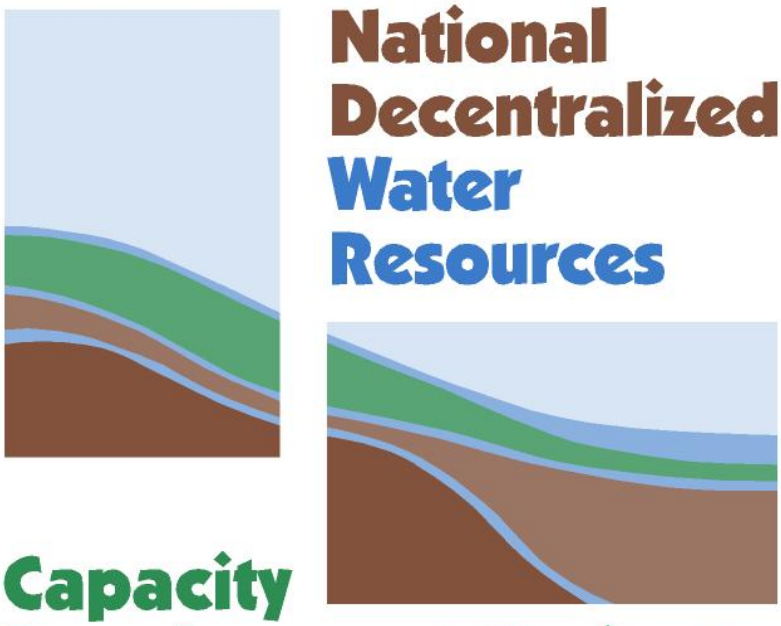
determine a series of nearer term collaborative actions among stakeholders. Specifically, the workshop was intended to begin an effective and meaningful dialogue about the future of water resource management among the many diverse sectors of the water industry; develop an integrated view of how Soft Path approaches may be applied and will evolve; provide a series of recommended actions/ initiatives for advancing the application of Soft Path approaches (ranging from demonstration project to community decision-making tools, and others); and generate ideas that the NDWRCDP may later use as input into the EPA working group on wastewater financing.

COMMUNITY DECISION-MAKING FORUM

The NDWRCDP with assistance from S. Christopher Associates convened a two-day Community Decision-Making Forum on July 28-29, 2004 that included participation from NDWRCDP project investigators, leadership from National Community demonstration projects, representatives of community resource providers, members of the NDWRCDP Project Steering Committee, and other related organizations, such as EPA and WERF. The goals of the Forum were (1) to assess the applicability of NDWRCDP-sponsored projects to decision-makers in each of the four scenarios developed during the 2001 Future Mapping Workshop; (2) to provide input to the development of a "Guide to NDWRCDP-Sponsored Projects to Community Decision-Making on Decentralized Wastewater Planning and Management"; (3) to provide feedback to the sponsored projects as to how their community process and analytic tools might be improved to enhance their use by decision-makers and by consultants to communities (as in facilities planning); and (4) to determine needs for additional research and development of community process and decision-making tools.

ENVIRONMENTAL SCIENCE & ENGINEERING FORUM

The NDWRCDP convened a two-day Forum on October 19-20, 2004 with NDWRCDP project investigators, invited experts with backgrounds and interest in the decentralized wastewater field and related disciplines, members of the NDWRCDP Project Steering Committee and WERF Decentralized Research Advisory Committee, and other invited guests to discuss the results of environmental science and engineering related research funded by the NDWRCDP and examine how well the goals and objectives of the NDWRCDP as defined by the NDWRCDP Training, Research and Development Plan have been met. The meeting included (1) presentation of NDWRCDP project results; (2) exploration of the implications for application of the research findings; (3) discussion of how the various projects fit together; (4) characterization of the contributions of the work to the decentralized wastewater field; and (5) identification of future research needs.



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