

# **Water Research in the Pacific**

Gary R.W. Denton, Ph.D.

**Water and Environmental Research Institute  
of the Western Pacific**



**WERI**

**University of Guam**



# Water & Environmental Research Institute of the Western Pacific

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**UNIVERSITY OF GUAM**

**UNIBETSEDĀT GUAHAN**

**Water and Environmental Research  
Institute of the Western Pacific**

**UOG Station  
Mangilao, Guam 96923**



**WERI**

**Dr. Gary R. W. Denton.**

**DIRECTOR & PROFESSOR  
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# Water & Environmental Research Institute of the Western Pacific

## *Mission Statement*

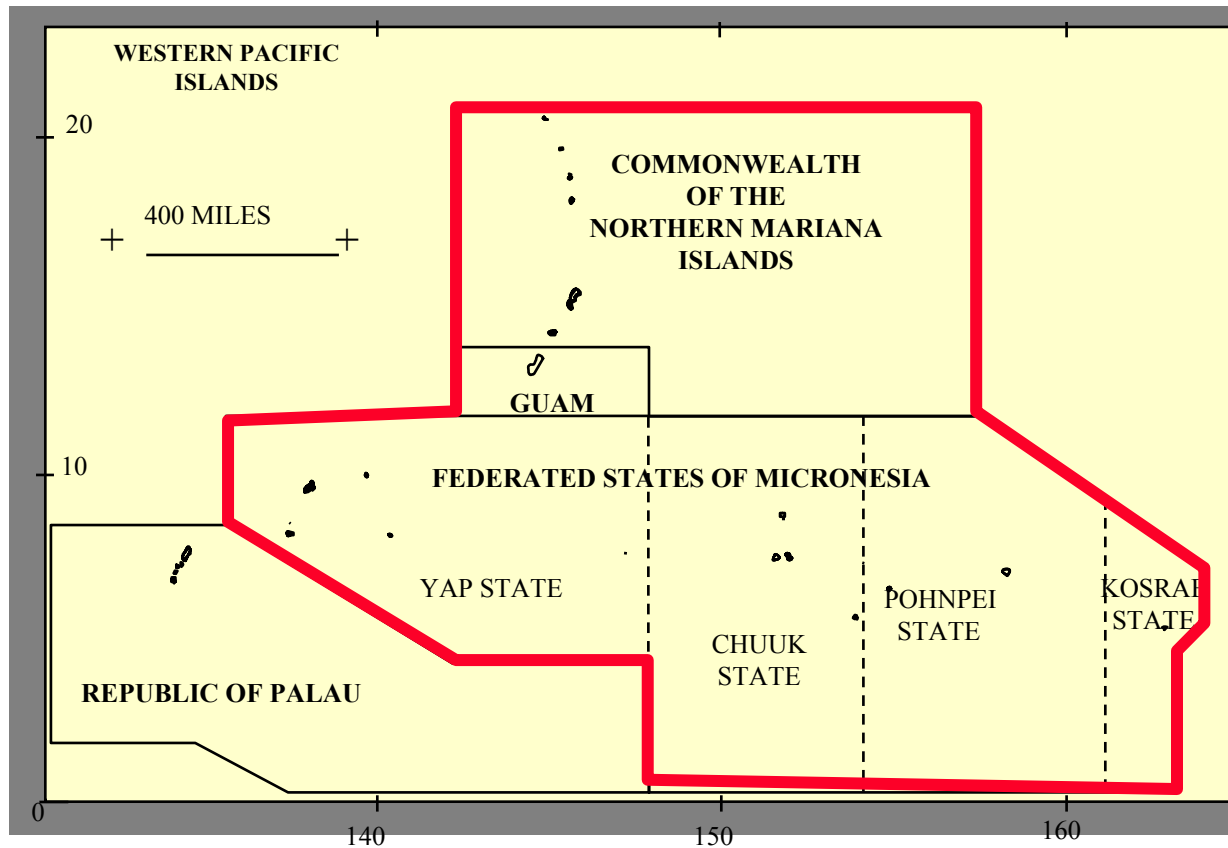
To seek solutions through research, teaching and outreach programs, to issues and problems associated with the location, production, distribution and management of freshwater resources







# Water & Environmental Research Institute of the Western Pacific



*Distance ~ 2000 miles (Kosrae – Yap)*  
*Total land mass area ~580 sq. miles*  
*Population 330,000*



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# Water & Environmental Research Institute of the Western Pacific

## *Faculty and Major Research Areas*

- Gary Denton: Environmental Toxicology
- Charles Luo: Surface Water Hydrology
- John Jenson: Groundwater Hydrogeology
- Shahram Khosrowpanah: Hydraulics
- Mark Lander: Tropical Climatology
- Yuming Wen: GIS Specialist





# Water & Environmental Research Institute of the Western Pacific



Dr. Gary Denton  
Environmental Toxicologist



Dr. John Jenson  
Groundwater Hydrologist



Dr. Shahram Khosrowpanah  
Civil Engineer



Dr. Mark Lander  
Tropical Climatologist



Dr. Charles Luo  
Surfacewater Hydrologist



Dr. Yuming Wen  
GIS Specialist

## Research Programs



Rooftop Rain Catchment Sizing

Aquatic Pollution Monitoring & Assessment

Groundwater and Surfacewater Modeling

Climate History

Soil Erosion Monitoring and Mitigation

Guam Hydrologic Survey

ENSO Applications Center

GIS Assessment of Land Cover Changes

Atoll Hydrologic Modeling

Guam Comprehensive Monitoring Program

Watershed Management

Glacial Till Modeling



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***Research priorities determined by Advisory Councils that meet annually to discuss critical water resources issues and problems encountered in each regional entity***



# General Research Areas

- Mapping
- Modeling
- Monitoring



- Management



- Maintenance

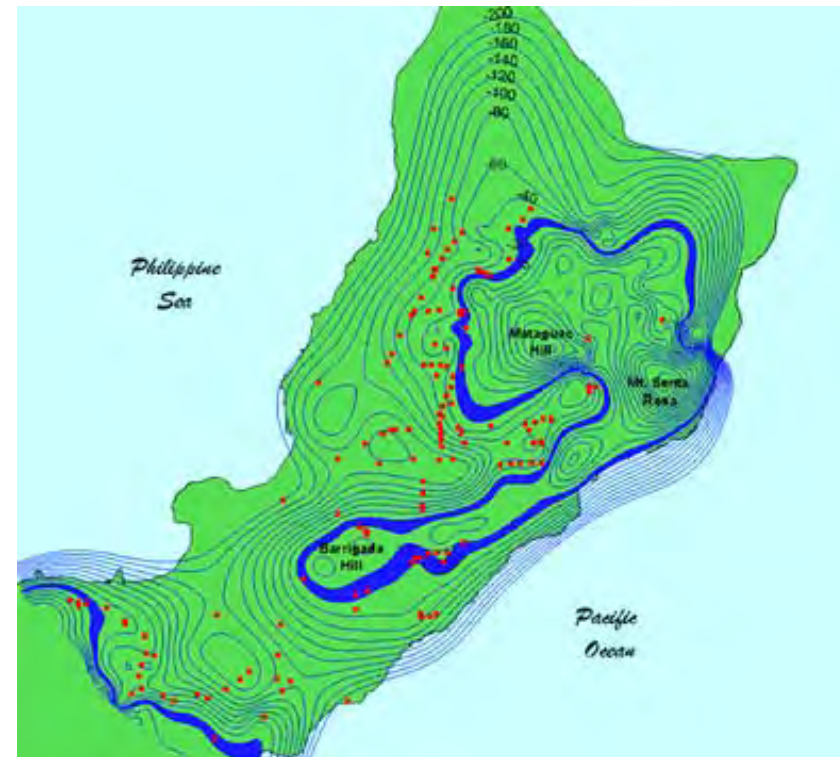






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## *Research Highlights*



***Mapping basement volcanics for optimization of  
drinking water well locations***



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## *Research Highlights*



*Mapping septic and other waste  
water systems above Guam's  
northern lens aquifer*

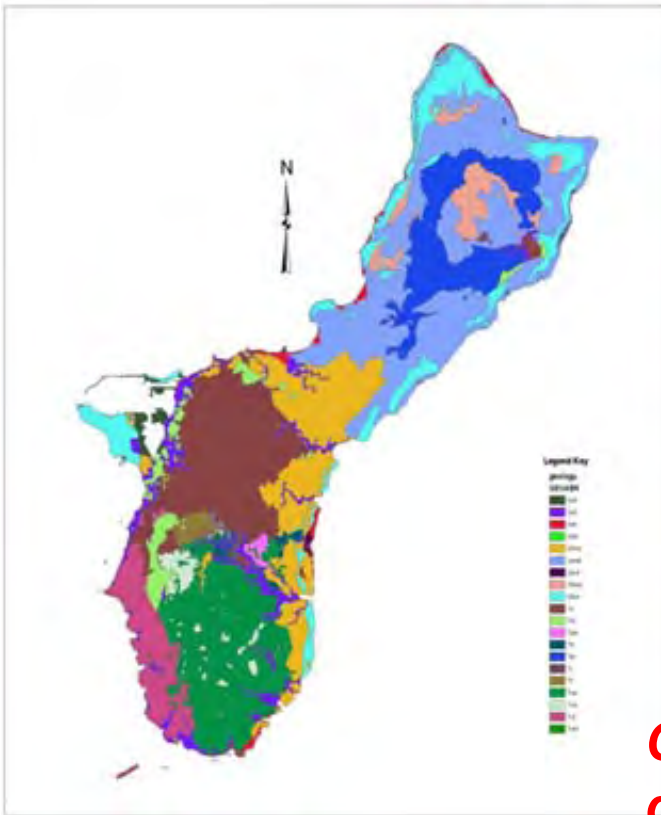






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## *Research Highlights*



*Guam Geologic map updated to show new data and advances in data interpretation*



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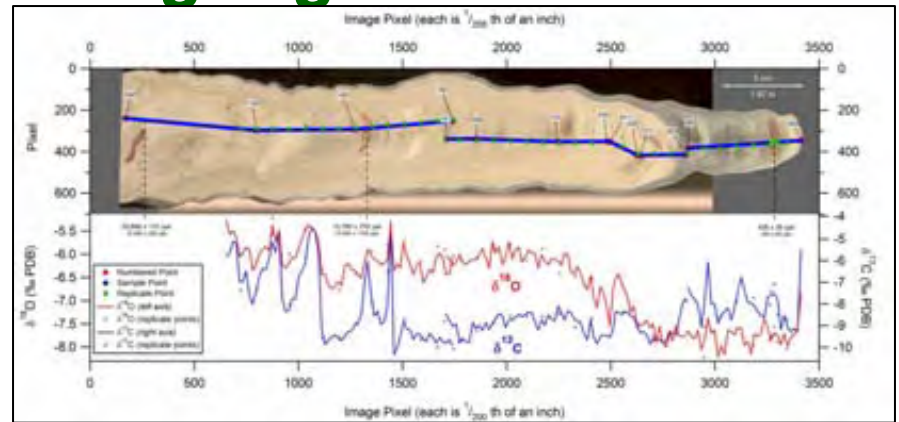


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## Research Highlights



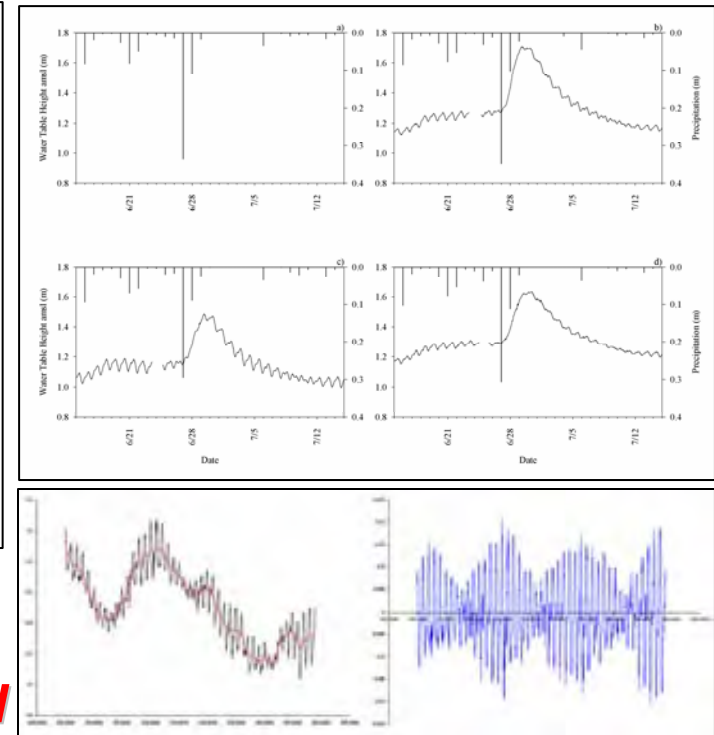
***Stalagmite from local cave provides insight into climate history of Guam (sea level rise, surface temps, El Niño cycles).***





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## Research Highlights



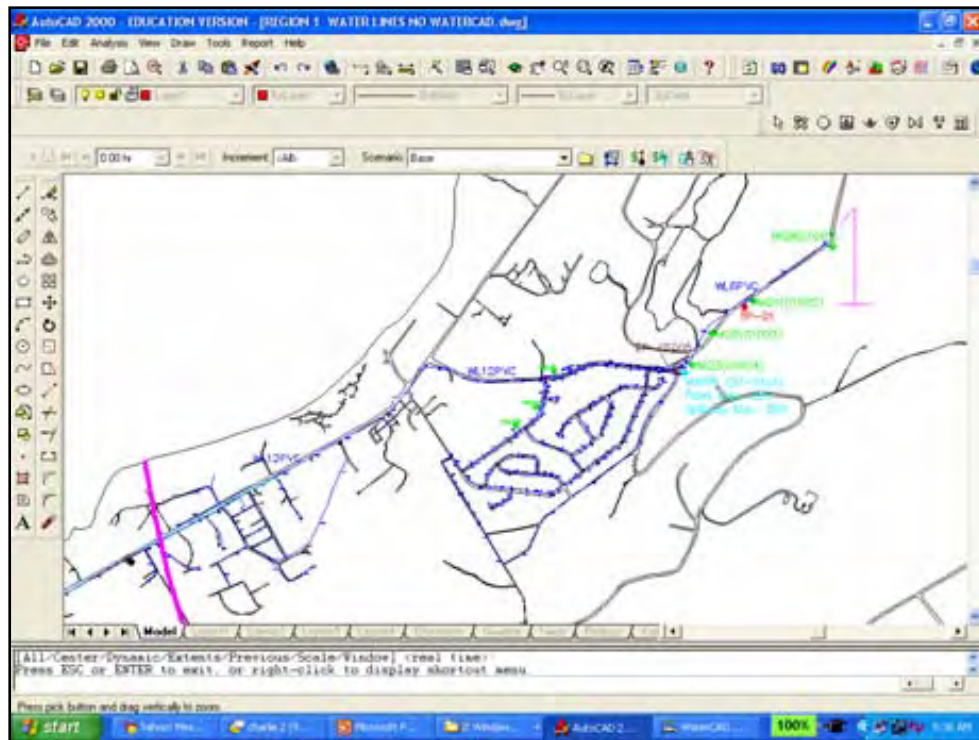
**Modeling the Northern Guam Lens Aquifer  
to determine maximum sustainable yield and  
precipitation response times of the water table**





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## *Research Highlights*



***WaterCAD hydraulic model of the Marpi area water distribution system in Northern Saipan and field varification of hydraulic model data at fire hydrant***



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## *Research Highlights*



*Water resource assessment, management,  
modeling and training on atoll islands*

**drought preparedness**



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## *Research Highlights*



Stream gage



Sediment sampler



Water level & salinity monitoring equipment



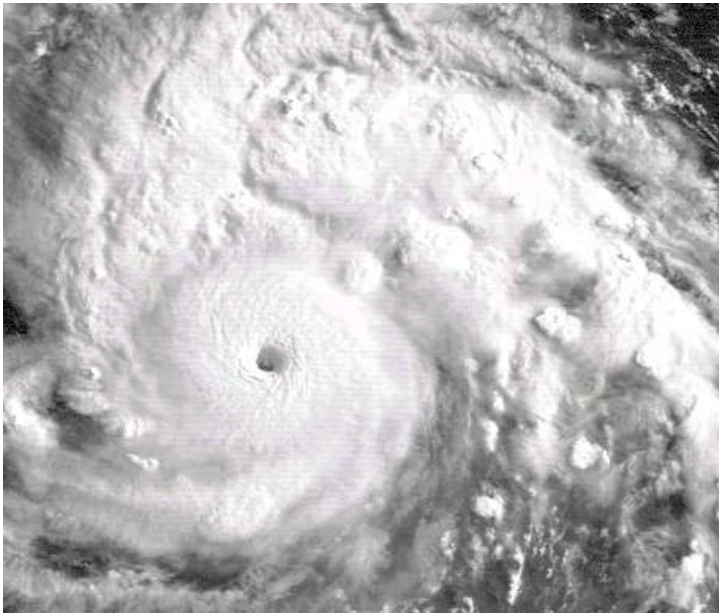
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*Quantitative and qualitative monitoring of  
Guam's surface and groundwater resources*

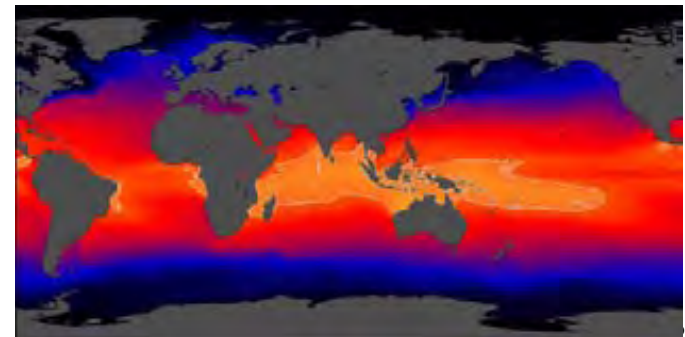


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## *Research Highlights*



*Typhoon damage assessment, impact of global warming on sea level rise, El Niño events and climate history of Western Pacific*







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## *Research Highlights*



***Determining the impact of aqueous  
contaminants released from Ordot Dump  
on fisheries resources in Lonfit-Pago River  
System and Pago Bay***





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## *Research Highlights*



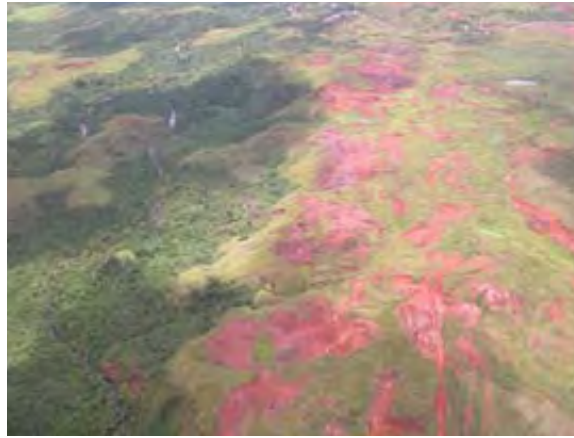
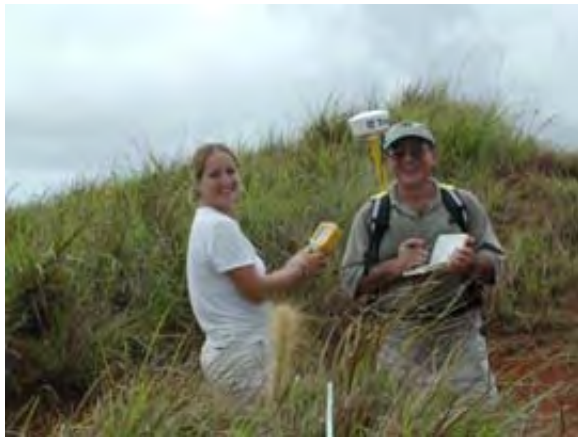
***Contaminant assessment of Saipan Lagoon and impact of Puerto Rico Dump and other potential sources of pollution on fisheries resources in the area***





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## *Research Highlights*



***Watershed management and restoration,  
With emphasis on soil erosion mitigation  
strategies for protection and preservation  
of coastal water communities***





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## *Research Highlights*



***Impact of clearing native forest to grow sakau (kava) on soil erosion in Pohnpei watersheds***











# Water & Environmental Research Institute of the Western Pacific

*Educating Tomorrow's Community Leaders*



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## *Staff Support*

- **Gwen Manglona:** Administrative Assistant
- **Norma Blas:** Secretary Typist I
- **H. Rick Wood:** Water Quality Lab Manager
- **Crispina Tagudin:** Laboratory Technician
- **John Jocson:** Staff Hydrologist



## OUTREACH

### FACULTY OUTREACH ACTIVITIES

WERI's information dissemination and outreach activities are carried out in a variety of ways ranging from the production of pamphlets, brochures and technical reports, to short courses, technical training workshops and associated field activities. WERI also features its research activities and Technical Reports in downloadable pdf format on its web-site at <http://www.weriguam.org>.



### WATER SYSTEM MAINTENANCE & REPAIR WORKSHOPS

Conducted annually and alternating between Yap and Pohnpei in FSM and Saipan in the CNMI, this one-week course reviews the operation, overhaul and preventative maintenance of pumps and automatic valves in a classroom setting with hands-on experience. Participants in the course are mostly employees of the Pohnpei U.S. Corporation and Yap State Public Service Corporation, and the Commonwealth Utilities Corporation of Saipan.



### CLOSED CONDUIT HYDRAULICS & WATER SYSTEM MODELS

Designed to improve the modeling expertise of engineering staff at and Guam Environmental Protection Agency (GEPA), this short course consists of 60 hours intensive training in fluid mechanics, water distribution system hydraulics, and the operation of the Hecstad model distribution system model "WaterCAD for AutoCAD". Participants receive both classroom training in the theoretical aspects of water system hydraulics and modeling and hands-on laboratory experience input data and running the Hecstad model.



### GROUNDWATER MANAGEMENT AND TRAINING

Yap Council of Chief listens to Mr. Ryan Bailey (WERI graduate student) explain groundwater management strategies for low island atolls in FSM.

# INTRODUCTION TO RESEARCH ACTIVITIES & TEACHING PROGRAMS

by

**Gary R.W. Denton Ph.D.  
Director**

# WERI

WATER AND ENVIRONMENTAL RESEARCH INSTITUTE  
OF THE WESTERN PACIFIC  
UNIVERSITY OF GUAM

February 2007

## TEACHING

### FACULTY TEACHING ACTIVITIES

WERI faculty play an integral role in the Environmental Science M.S. Program, collectively teaching ~50% of the available courses, advising between 5-10 students at any one time, and producing a little over 60% of graduating students to date. The undergraduate Pre-Engineering Program also falls under the purview of WERI.



### GRADUATE EMPLOYMENT STATUS

WERI graduates emerging from the Environmental Science M.S. Program generally find employment in environmental and related fields in industry, government and education. Approximately 15% go on to pursue higher degrees and ~30% find employment locally.



### WERI GRADUATES

**LH Picture:** Alex Soto (left) and Tom Nadeau (right) graduated from the Environmental Science M.S. Program in 2001. Alex, who was employed by Guam EPA at the time, later served as the agency's Chief Administrator before being appointed Environmental Compliance Superintendent with a Guam-based US Navy contractor. Tom continued working at Guam Department of Public Health and is now the Departmental Administrator for the Division of Environmental Health.

**RH Picture:** Ryan Bailey graduated from the program in 2007 and is currently pursuing a Ph.D. in Civil Engineering (Hydrology) at Colorado State University and focusing on desert irrigation. Among several other rising stars are -



**Jhelia Hoffman (2007)** Environmental Scientist, Seminole Nation, FL.  
**Michael Park (2007)** Environmental Scientist, Divers & Assoc., Guam.  
**Rob MacCracken (2006)** Hydrologist, Aqua Terra Ltd., Western Australia.



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OF THE WESTERN PACIFIC UNIVERSITY OF GUAM

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# WERI

## WELCOME

You have entered the website of the Water and Environmental Research Institute of the Western Pacific (WERI), at the University of Guam. We are currently six faculty and five staff strong and our mission is to seek solutions through research, teaching and outreach programs, to issues and problems associated with the location, production, distribution and management of freshwater resources in Guam, the CNMI and the FSM.




### MESSAGE FROM WERI DIRECTOR, DR. GARY DENTON



Hello and welcome to the website of the Water and Environmental Research Institute of the Western Pacific, otherwise known as WERI. This recently updated version of our website provides you with a brief overview of the Institute's evolution and regional mission, and introduces you to the faculty and staff. It gives you a glimpse of our faculty research interests and the research programs they oversee. It also provides you with summaries of their recently completed research projects as well as those currently underway. Our research priorities are determined largely by local needs and are identified by stakeholders represented at our annual advisory council meetings. As a consequence, basic and applied research projects that focus on local water quantity and water quality problems are the order of the day. We are fortunate in having experienced, well rounded faculty with collective expertise in all major fields pertinent to the management, distribution and protection of water resources in the tropical Pacific region.

The current website has updated WERI's technical report listings. These reports are in pdf format for direct viewing and retrieval at your leisure. One may search the technical report data base by title, year, author and keyword in order to retrieve the report or reports that are of greatest interest to you. If, for any reason, you are unable to view a report, or have comments or suggestions for improvement to the website in general, please feel free to contact me at [gdenton@puog.edu](mailto:gdenton@puog.edu).

Those of you who are familiar with this website will recognize that there has been a recent change in the WERI Directorship. My predecessor, Dr. Leroy Heitz, passed that baton on to me in October of last year after serving as the Institute's Director for six years. Leroy was an outstanding leader who brought cohesiveness and stability to WERI and did much to shape the Institute into the premier water resources research center that it is today. Sadly, he will be leaving us towards the end of the year and retiring with his wife, Joe, to their home in Arizona. We wish them well and hope to see them back here from time to time. Meanwhile, I will try to emulate Leroy's leadership as best I can until the baton is passed on once again.

On behalf of the Institute, I would like to thank Gary Sung, creative director of Ideal Advertising for his inspiring redesign and upgrade of the previous website to its current format. We would also like to thank the Department of Interior, U.S. Geological Survey, for funding this web renovation project through the Water Research Institute (WRII) Program. Congressman Madeleine Z. Bordallo deserves special mention supporting the 2007 reauthorization of the WRII Act and for her continued interest in the WRII program. Finally, we are indebted to the University of Guam and the people of Guam, the CNMI and their unfailing support of the water research programs at WERI.

### LATEST NEWS

This is the latest news quick launcher.

- National Water Institutes Program Grants approved

### CURRENT PROGRAMS

- GIS PROGRAM
- POLLUTION MONITORING AND ASSESSMENT PROGRAM
- SOIL EROSION MONITORING AND MITIGATION PROGRAM
- WATERSHED MANAGEMENT PROGRAM
- ENSO APPLICATIONS CENTER
- WETLANDS PROGRAM
- ROOFTOP RAIN CATCHMENT
- GROUNDWATER RESEARCH
- ATOLL HYDROLOGIC MODELING

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