USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003GU20B

Title: Groundwater Infiltration and Recharge in the Northern Guam Lens Aquifer as a Function of Spatial and Temporal Distribution of Rainfall

Project Type: Research

Focus Categories: Water Quantity, Hydrology, Climatological Processes

Keywords: Wellhead Variations, Time-lag response, Climate, Data Analysis, Rainfall

Start Date: 03/01/2003

End Date: 02/29/2004

Federal Funds Requested: $14986.00

Matching Funds: $0.00

Congressional District: N/A

Principal Investigators: Lander, Mark (WERI University of Guam)

Abstract: In ongoing work, we have identified at least three time periods for wellhead response to rainfall. One of these is an almost instantaneous response to widespread heavy rains such as that which occur during monsoon squalls or tropical cyclones. The increase of the wellhead from such events returns exponentially to near the background state within a period of approximately 8 to 10 days. A slow rise and fall of the background state is closely tied to instantaneous variations in sea level and to monthly rainfall totals in the current month's rainfall, with significant contribution from rainfall in the two preceding months. Long-term surpluses and deficits of rainfall (largely a result of recurring episodes of El Niño) appear in the wellheads at a lag of approximately 18 months. Die trace studies also show transport of water from the die injection site to the monitoring sites to occur over a wide range of time periods from nearly instantaneous to almost 2 years. From the proposed study, we expect to gain further corroboration of the time lags at which water moves through, and is stored in the Northern Guam Lens Aquifer. A graduate student will acquire and analyze independent data from more recent years (1997-2001), and also acquire and analyze wellhead data from years prior to those already used for study. Statistics and graphs from this project will provide a means of inferring the proportion of water from a given storm that is actually captured in long-term storage by the lens and is thus available for extraction by pumping. From

the proposed project we expect to produce a set of statistical models that will predict, to a known degree of accuracy, the proportion of rainfall that is retained in short and long-term storage. Hydrologists will then be able to make wellhead predictions based on known rainfall variations and known storage parameters. The nearly two-year lag in the response of the wellheads to long-term surpluses and deficits of rainfall may allow for long-term prediction of wellheads. These could be especially accurate if rainfall variations due to EL Niño could be accurately anticipated (as they were in 1998 and again in 2002).
