ONE-GUAM
WATER RESOURCES INFORMATION PROGRAM

MEMORANDUM OF AGREEMENT

GWA and WERI/PIWSC

21 October 2022

GUAM WATERWORKS AUTHORITY
UNIVERSITY OF GUAM WATER AND ENVIRONMENTAL RESEARCH INSTITUTE OF THE WESTERN PACIFIC
U.S. GEOLOGICAL SURVEY PACIFIC ISLANDS WATER SCIENCE CENTER

21 October 22

MEMORANDUM OF AGREEMENT
BETWEEN
GUAM WATERWORKS AUTHORITY
AND
THE UNIVERSITY OF GUAM WATER AND ENVIRONMENTAL RESEARCH INSTITUTE OF THE WESTERN PACIFIC
AND
U.S. GEOLOGICAL SURVEY PACIFIC ISLANDS WATER SCIENCE CENTER

Subj: MEMORANDUM OF AGREEMENT TO IMPLEMENT THE ONE-GUAM WATER RESOURCES INFORMATION PROGRAM

Ref: (a) Memorandum of Understanding between Guam Waterworks Authority, Guam Consolidated Commission on Utilities, Naval Facilities Engineering Command Marianas, and Joint Region Marianas dated 7 December 2016

Encl: (1) Components of a Water Resources Information Program
(2) One-Guam Water Resources Information Program Structure
(3) WERI-PIWSC One-Guam Work Plan

1. Purpose. Guam Waterworks Authority (GWA), as the local drinking water provider; and the University of Guam (UOG) Water and Environmental Research Institute of the Western Pacific (WERI) and U.S. Geological Survey (USGS) Pacific Islands Water Science Center (PIWSC), as designated collaborating scientific advisors to GWA and Naval Facilities Engineering Command Marianas (NFM) under the provisions of Reference(a) agree to implement the OGWRIP. This document defines the agreements of the Parties and the responsibilities of each Party under the OGWRIP.

2. Background. Reference (a) was developed to explore opportunities for partnering and integration of water and wastewater utilities to better meet the needs of the island's population, including growth from the proposed military buildup.

The following information is all from Reference (a):

Paragraph 6i, Organizational Components, establishes the Technical Experts Group (TEG), including WERI and USGS, to "develop and maintain all databases and technical tools" and to "identify problems and propose solutions."

Under paragraph 6k, WERI is specifically designated as repository of all water-related data and called on to "perform technical studies related to [Guam's] water resources."

Para. 7d(1), Terms of Understanding, calls for all parties to "cooperate in determining the most cost-effective and timely source(s) of funding to facilitate solutions...."

Para. 7d(2), Terms of Understanding, calls for all parties to "cooperate in completing studies related to meeting the drinking water needs of Guam including NGLA [Northern Guam Lens Aquifer] sustainability studies."

3. Applicability. This document and the objectives, goals, and processes agreed upon are subject to applicable laws of the United States, the Government of Guam (GovGuam), and the Department of Defense (DoD). The Parties agree that legal requirements applicable to either Party take precedence over any agreement reflected in this MOA.

4. Objectives. To meet the provisions of References (a) cited above by establishing the OGWRIP organizational structure, mission, activities, and funding.

5. Mission. The One-Guam Water Resources Information Program will provide DoD and GWA with accessible and reliable data; timely analyses and reports; directed research on critical topics; expert advice for informed water-resource management, engineering, and policy decisions; and professional education, technical training, and outreach support to best manage the drinking-water resources of Guam.

The targeted data collection and investigations will enable GWA and NFM to employ adaptive-management techniques by iteratively reassessing the efficacy of management policies and the understanding of the water-resource systems.

6. Activities. The Water Resources Information Program shall consist of a hierarchy of activities that can be visualized as a pyramid as shown in Enclosure 1.

Data will be collected, processed, organized, interpreted, and applied. Information products derived from the data will be made

available to users starting with raw data, up through the conclusions and recommendations of advisory papers, technical reports, and professional papers.

7. Organizational structure. The integrated One-Guam Water Resources Information Program will consist of the One-Guam Water Resources Monitoring System (OGRWMS) and the One-Guam Water Resources Analytical Program (OGWRAP) in which WERI and USGS will provide services to both NFM and GWA, as defined in section 10, Roles and Responsibilities. (See glossary of terms in Enclosure 2.)

8. Terms of Agreement. The Parties understand the need for close collaboration. Accordingly, the Parties agree to:

a. Cooperate in preparing annual plans and budgets for the OGWRIP.

b. Jointly support the preparation and presentation of annual plans and budgets by the service providers to the funding providers.

c. Collectively identify and discuss services and products needed by NFM or GWA and the resources on hand or needed by WERI and PIWSC for providing them.

d. Manage the OGWRIP to promote scientifically informed decision-making and best practices to ensure the health of the NGLA, and Guam's water resources as a whole, in accordance with the objectives of reference (a), and the mission of OGWRIP as stated in para. 5, above.

9. Responsibilities. The responsibilities and expectations for the parties under this agreement are outlined below.

a. UOG/WERI and USGS/PIWSC will jointly:

(1) Prepare a *WERI-PIWSC One-Guam Work Plan* (Enclosure 3), which will be the basis for the annual budget.

(2) Provide the deliverables identified in the annual work plan (Enclosure 3) based on the following topics:

i. Perennial water resources monitoring services, reports, and an archive for the data and products.

ii. Perennial analytical services and products including up-to-date maps, state-of-the-art models, and expert advice.

iii. Annually selected projects to meet immediate or anticipated operational or capital improvement needs:

iv. Professional education, technical training, and outreach for engineering staff, managers, planners, and executives.

b. GWA will:

(1) Provide funding for the program and facilitating continued access to data-collection sites located on GovGuam property.

10. Annual budgeting and funding process

a. Budgeting timeline

1. During October through December of any given year, all Parties will jointly prepare the annual plan for OGWRIP services and products and the accompanying combined annual OGWRIP budget for the subsequent fiscal year.
2. By the fifteenth of February each year, WERI will submit to the Guam Legislature through the University of Guam, the requests for the GovGuam shares of their respective budget components within the OGWRIP budget. The same budget can be submitted to the Guam Legislature on the first of August to comply with CWMP and GHS enabling statutes.
3. When the legislative appropriation process is complete and UOG has been advised of the appropriations of the GovGuam shares of the CWMP and GHS carried for OGWRIP in the UoG budget, UOG will advise GWA of the appropriations and adjust budget shares accordingly in order to balance the budget. In the event of a shortfall in the budget allotment payments from DOA, GWA will fulfill the remaining balance for the fiscal year.

b. Stipulations

1. WERI and UOG will provide a quarterly update to the other Parties documenting the status of funding from the Guam Legislature and disbursements from DOA.
2. Transfers of funds will be made in accordance with existing provisions.

11. Other Provisions

a. Enforceability

(1) Performance. Performance under this MOA by all Parties is dependent upon lawful appropriation, availability, and allocation of funds by proper authorities. Nothing herein shall constitute nor be considered to constitute an obligation or expenditure of funds in advance of or in excess of proper appropriations for either Party (for DoD: Congress of the United States or otherwise be in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341 et seq.; for GWA: Their management and/or the CCU or the Public Utilities Commission (PUC). This MOA does not create an actual or implied intention, or requirement for the USGS to enter into a contract or an assistance agreement (e.g., grant or cooperative agreement).

(2) Benefits. This MOA is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity, by any Party against the United States or GWA, or agencies, instrumentalities, officers, employees, or agents of either.

(3) Non-Exclusivity. This agreement in no way restricts DoD and USGS from participating in similar activities or arrangements with other public or private agencies, organizations, or individuals.

(4) Endorsements. Nothing in this agreement may be interpreted to imply that the United States, the Department of the Interior, or the USGS endorses any GWA or WERI product, service, or policy. GWA and WERI will not take any action or make any statement that suggests or implies such an endorsement.

(5) Federal Advisory Committee Act. The parties will comply with the Federal Advisory Committee Act to the extent it applies.

(6) Interagency Agreements. This MOA does not commit the USGS or DoD to enter into any specific interagency agreements for the purpose(s) of this MOA. Projects involving cost sharing or reimbursable funding between the agencies must be included in follow-on interagency agreements.

b. Resolution of Disagreements

(1) The Parties shall consult with one another to resolve issues and elevate disputes through the respective chains-of-command only if necessary.

(2) Notification of areas of disagreement by any Party will be submitted in writing by and between the WERI Director or the PIWSC Director and the GWA General Manager.

12. Statutory Authorities. USGS authority to enter into the MOA is provided by The Organic Act of March 3, 1879, as amended, 43 U.S.C. 31 et seq., and 43 U.S.C. 36c.

13. Modification. Modifications to this agreement may be made with the concurrence of all Parties. Modifications desired by any Party are to be requested in writing at least 60 days in advance of the proposed effective date and will become effective only if agreed upon in writing by all Parties.

14. Review. This MOA will be reviewed triennially and/or when there is a change in principals to evaluate its effectiveness and determine if any modifications are required.

15. Effective Date. This MOA is effective upon the date of final signature and shall remain in effect for a period of nine years. This MOA may be terminated by any of the Parties upon providing 90 days written notification to all Parties.

APPROVED:

MIGUEL C. BORDALLO, P.E.
General Manager
Guam Waterworks Authority

Date: 2022.10.21

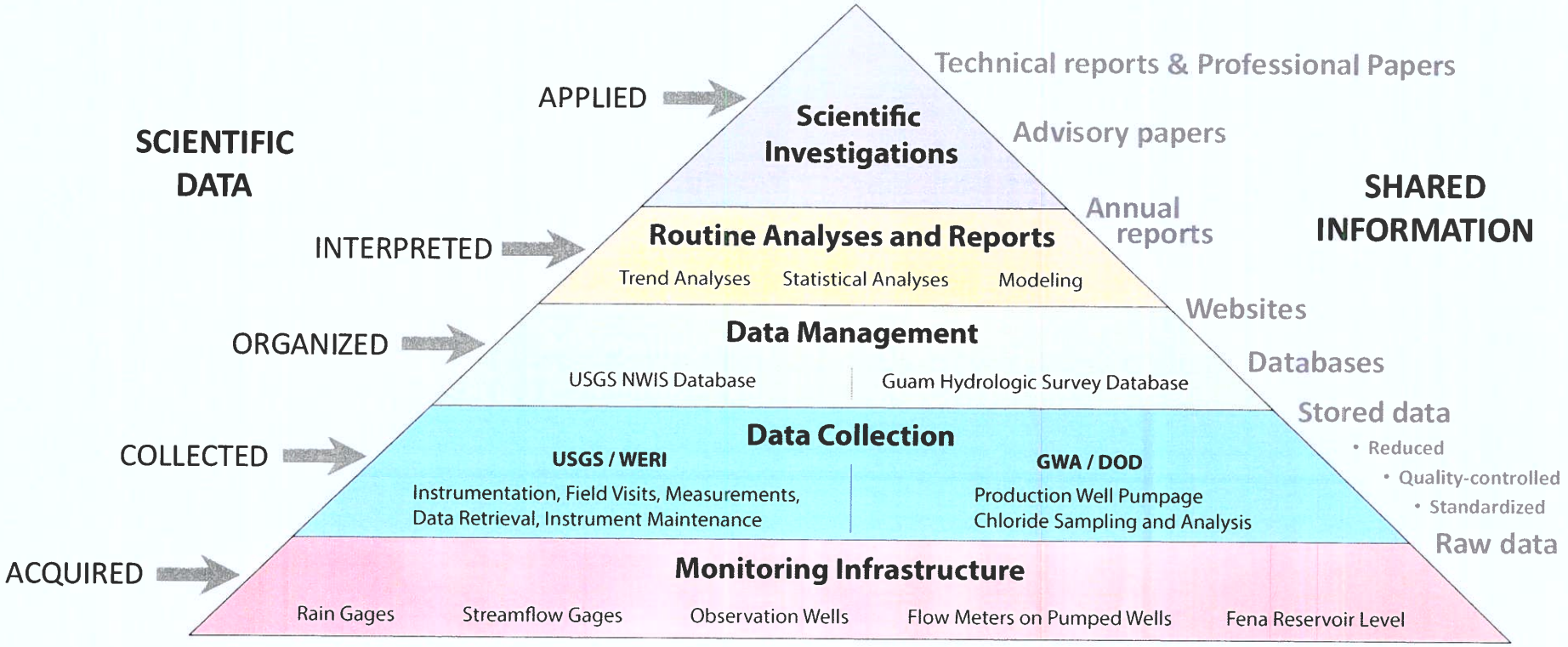
John P. Hoffmann
Director, Pacific Islands
Water Science Center
U.S. Geological Survey

Date: 10-21-22

Thomas W. Krise, Ph.D.
President
University of Guam

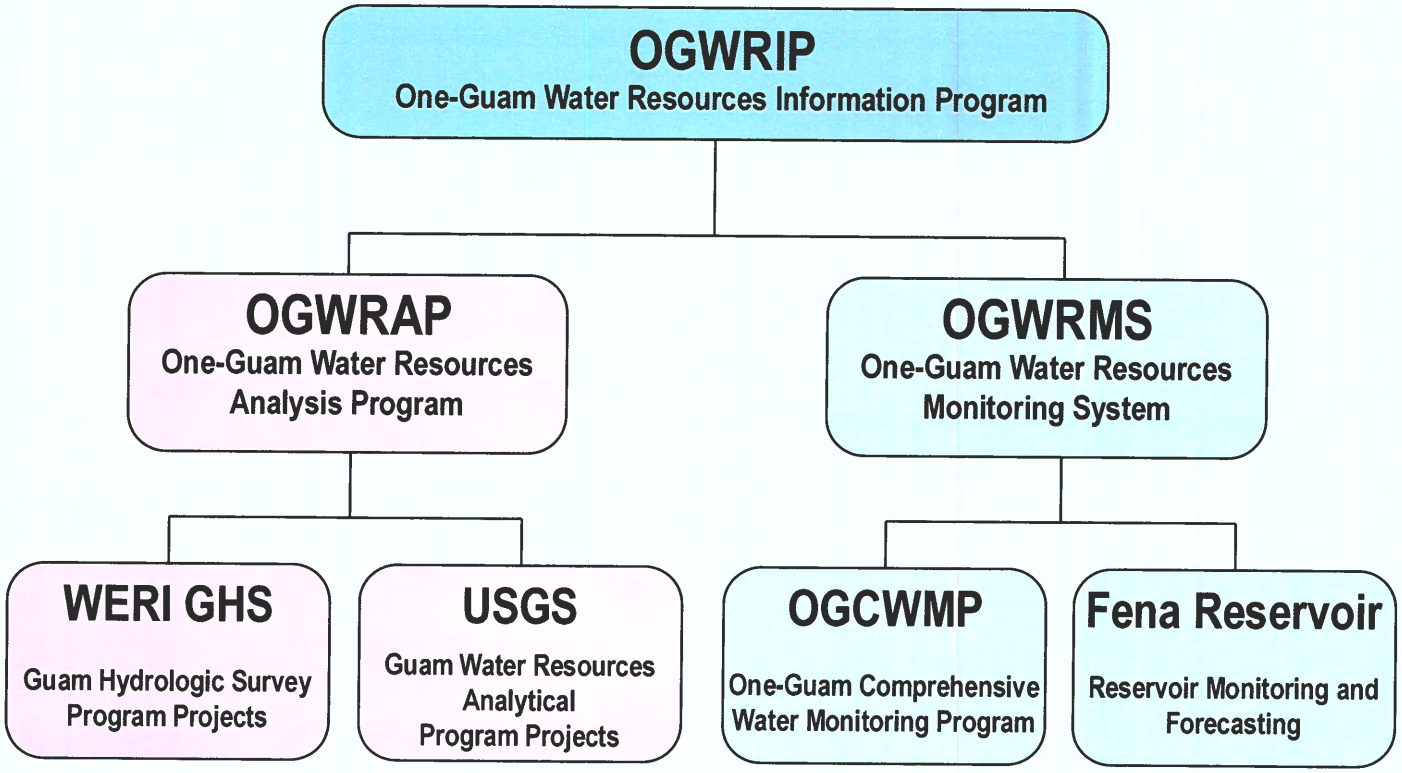
Date: 21 OCT 2022

Components of a Water Resources Information Program



Enclosure 1. The essential components of a water resources information program.

One-Guam Water Resources Information Program (OGWRIP) Program Structure



Enclosure 2. Organizational structure of the One-Guam Water Resources Information Program.

Glossary of terms

Fena Reservoir Monitoring A program that contains the monitoring of water level in Fena Reservoir, semi-annual vertical-datum surveys of the Fena Reservoir dam settlement markers, and quarterly reports of projected water level in the reservoir.

Guam Hydrologic Survey (GHS) A program within the Water and Environment Research Institute of the Western Pacific—established by the Guam Legislature in 1998 with Public Law No. 24-247—that archives hydrologic data from Guam and conducts research on water-related issues of local importance.

Guam Waterworks Authority (GWA) The public utility provider for Guam—established by the Guam Legislature in 1996 by Public Law No. 23-119.

Naval Facilities Engineering Command Marianas (NFM) The utility provider for military bases on Guam and Oceania.

One-Guam Comprehensive Water Monitoring Program (OGCWMP) An expansion of the original Comprehensive Water Monitoring Program (CWMP)—established by the Guam Legislature in 1998 with Public Law No. 24-161—that provides long-term hydrologic information that can be used to understand and sustainably manage Guam's water resources.

One-Guam Water Resources Analytical Program (OGWRAP) A program containing all hydrologic analyses and data interpretation, including but not limited to, statistical trend analyses, annual summary reports, groundwater modeling, groundwater-flow-direction analyses, reservoir-level forecasting, and outreach support.

One-Guam Water Resources Information Program (OGWRIP) A collaborative program between the Guam Waterworks Authority, Naval Facilities Engineering Command Marianas, Water and Environmental Research Institute of the Western Pacific, and USGS to protect the Northern Guam Lens Aquifer and other water supplies on Guam by providing water-resource managers with objective scientific information for decision making. The program includes data collection, analysis, modeling, and regular meetings with stakeholders.

One-Guam Water Resources Monitoring System (OGWRMS) A program containing all hydrologic data-collection sites and monitoring activities on Guam.

Pacific Islands Water Science Center (PIWSC) An office within the U.S. Geological Survey that conducts hydrologic monitoring and investigative studies on a wide variety of issues affecting water resources in the State of Hawai'i and the U.S. Affiliated Pacific Islands.

U.S. Geological Survey (USGS) A scientific, non-regulatory agency of the U.S. Department of the Interior that studies the landscape, natural resources, and natural hazards of the United States.

Water and Environment Institute of the Western Pacific (WERI) A research institute within the University of Guam that provides research, education, and outreach on hydrologic resources for Guam, the Commonwealth of the Northern Mariana Islands, and the Federated States of Micronesia.

Enclosure 2. Organizational structure of the One-Guam Water Resources Information Program.—Continued

Joint Annual Plan for WERI-PIWSC One-Guam Deliverables to Guam Waterworks Authority and NAVFAC Marianas

1 July 2022 – 30 September 2023

Prepared in accordance with Enclosure 3, One-Guam MOA, [Date and name of MOA will go here.... ... .] [1]

I. PERENNIAL PRODUCTS AND SERVICES

Perennial products and services are those that are steadily produced or permanently in place.

A. Products: Tools and References for Guam Water Resources Management

Products listed below are accessible on the WERI and USGS websites.[2] Selected items are published in hard copy as pamphlets or posters and are available at WERI.

1. Aquifer Map (WERI). First compiled in 1998 and updated regularly with new data and geospatial tools, WERI's *Hydrogeologic Map of the Northern Guam Lens Aquifer* is the foundation for groundwater exploration, development, modeling, and management. The map is available online at VB2018Poster1 (uog.edu). WERI Technical Report 142 contains details regarding its construction.
2. State of Aquifer Report (WERI, PIWSC). Contains up-to-date and reliable basic information for water resources professionals, policy makers, educators, students, and interested citizens. It is available online, where it is updated continually and revised annually.
3. Reports of Analyses and Modeling Results (WERI, PIWSC). Outcomes of modeling studies are documented in summary reports that provide explanations and advice in non-technical language to inform and support management decisions.
4. Databases and Websites (WERI, PIWSC). WERI and USGS databases and websites contain historic and current hydrologic data including thousands of scanned historical documents
    - Local databases (WERI) include the GHS Borehole Database and the GHS Chloride and Production Database.
    - National databases (USGS) include the National Water Information System (NWIS) database and the GeoLog database.
5. Scientific and Technical Reports Library (WERI, PIWSC). The library contains links to downloadable copies of all of the WERI and USGS technical reports and advisory papers. It is available online.

B. Services for Guam Water Resources Management

Services listed below are delivered at meetings, presentations, and workshops for GWA employees, NFM staff, CCU members, and other policy makers and agency heads. All content is published online.

1. Comprehensive Water Monitoring Program (PIWSC, WERI). This is the premier service provided by USGS through its partnership with WERI. The program provides quarterly data collection and servicing of rain gages, stream gages, and observation wells by USGS teams supported by WERI. Uses of data by researchers, managers, regulators, students, and policy makers include:
    - Tracking the thickness and condition (water levels and salinity) of the freshwater lens and documenting trends and patterns in storage and salinity across the aquifer.
    - Calibrating groundwater and water-budget models to acheive accuracy and evaluate precision.

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[1] Note: This plan is for the transitional year from now until the end of FY2023. Henceforth, the plan will be prepared concurrently with the budget cycle for each fiscal year.

[2] Håfa Adai | Guam Hydrologic SurveyGuam Hydrologic Survey (uog.edu) ; USGS Current Water Data for Guam

2. Modeling Programs (PIWSC, WERI). Primary tools to simulate real-world conditions to understand, predict, and manage water resources. Are essential because experiments are not practical.
   - Groundwater (PIWSC, WERI).
     - The USGS numerical groundwater-flow and salinity model—developed 2010-2013 with support from the U.S. Marine Corps—will be used to evaluate the effects of selected aquifer-scale and long-term recharge and withdrawal scenarios on groundwater conditions and the availability of potable water. USGS and WERI models will be upgraded and recalibrated at five-year intervals using data from the CWMP observation well network.
     - WERI will use the AQUAVEO GMS advanced modeling system to separately simulate each of the aquifer's six basins at sufficiently fine scale to resolve effects of individual wells. Scenarios will explore alternatives proposed by GWA and/or NFM for optimizing production by changing pumping rates and/or relocating individual wells and wellfields.
   - Surface water. USGS provides quarterly forecasts of estimated stage (water level) in Fena Reservoir. The forecasts estimate reservoir stage for pumping scenarios using El Niño–Southern Oscillation (ENSO) rainfall projections developed by WERI/UOG.
3. Annual Professional Presentations and Workshops
   - August: *WERI Regional Advisory Meeting*. This will be held annually in conjunction with the annual American Water Works Association local chapter meeting. This meeting features:
     - *Activities Reports* on projects that are recently completed, ongoing, or recently funded
     - *Regional State of the Climate Report* modeled after the ENSO Newsletter Reports
   - November: *WERI Guam Advisory Meeting and Workshop*. This is a day-long event with up to three two-hour workshop sessions on:
     1. *Aquifer Report* (WERI-USGS *State of the Aquifer* presentation)
     2. *Aquifer model updates and developments*
     3. *Guam drought resiliency workshop and plan review*
   - March–April: *Aquifer Field Trips.* In-person tour (4-6 hours) or digital variants (2–4 hours)
4. Quarterly Technical Experts Group (TEG) meetings. The TEG is established by the MOA to (1) share data, (2) identify concerns, and (3) propose solutions to the One-Guam Water and Wastewater Working Group. WERI and USGS will present an *NGLA Status and Trends Update* at each meeting.
5. Quarterly workshops for ongoing management support. These will include 2-to-4-hour instructional sessions (which may be credited for Professional Development). They may be delivered in conjunction with the quarterly One-Guam TEG meetings. Proposed topics for now include:
   - NGLA Monitoring Workshop (1st quarter)
   - Production Management Workshop (2nd quarter)
   - Emerging Contaminants Workshop for GWA/GEPA (3rd quarter)
   - Use of WERI Tools: maps and database navigation, application (4th quarter)
   - Selected topics of interest to GWA, NFM, other agencies, policy makers upon request

II. ANNUALLY SELECTED PROJECTS

A. Technical Support / Studies on an as-needed basis

These topics will be identified for RFP to interested researchers during annual WERI Advisory Meetings and programmed into WERI-USGS research agendas for the coming fiscal year.

Topics suggested by GWA for this year and the near future include:

1. Scientific support for cesspool and septic tank (C&ST) elimination (ongoing for FY22–FY23)
2. Scientific support for Production Pumping Rate optimization (proposed for FY23–FY24)
3. Well siting optimization: re-siting vs. rehabilitation of wells (proposed for FY23–FY24)
4. Study of correlation between vadose zone thickness and nitrate concentrations
5. Studies of stormwater impacts on NGLA and other infrastructure

PROPOSED/ANTICIPATED SCHEDULE

August 2022

- Tue, 30 Aug: *WERI Regional Advisory Meeting*, Online w/Guam, CNMI, FSM advisory groups
  - WERI faculty and students present reports on projects, solicit suggestions.
- Thu-Fri, 1-2 Sep: *AWWA Meeting*, Hybrid.
  - Annual meeting with presentations, business session, field trips

September-October 2022

- WERI faculty begin proposals for One-Guam cycle, in consultation with GWA, NFM, others
- WERI on-site/in-person advisory meetings in CNMI (Thu, 15 Sep) and FSM (Thu, 20 Oct).
- Technical Experts Group Mtg, 1st Quarter FY2023: NGLA Monitoring Workshop

November 2022

- Thu, 10 Nov: *WERI Guam Advisory Meeting and Annual Workshops*, Tumon, hybrid:
  1. *WERI Mission: Who We Are and What We Do*, 20 min.
  2. *State of the Aquifer Workshop:* WERI & USGS SOTA presentations, discussion, instruction, 2 hrs
  3. *Aquifer Model Update/Developments Workshop:* WERI, USGS, 1 hr. each)
  4. *Guam Drought Resiliency Workshop / Plan Review for Northern Aquifer and Southern Watersheds* (WERI, USGS, 1 hr. each)
- WERI faculty prepare proposals for coming One-Guam funding period, with GWA, NFM.

December 2022

- WERI faculty submit One-Guam (GHS) proposals to WERI directorate to prepare One-Guam Budget in coordination with USGS for inclusion in UOG budget
- WERI faculty submit USGS 104b proposals to WERI director for forwarding to USGS.

January 2023

- WERI directorate submits One-Guam Budget to UOG, which submits budget requests to Legislature/GWA and NFM
- TEG Mtg, 2nd Quarter FY2023: Production Management Workshop

February 2023

- WERI faculty submit One-Guam (GHS) proposals to WERI directorate to prepare One-Guam Budget in coordination with USGS for inclusion in UOG budget

March-April 2023

- WERI Aquifer Field Trips: Senior Executives, Professionals
- UOG Budget Hearing at Legislature
- TEG Mtg: Emerging Contaminants Workshop (GWA/GEPA, 3rd Quarter, FY2023)

May 2023-June 2023

- Summer fieldwork, laboratory work, travel, training gets underway for funded projects
- UOG budget approved by Legislature's committees, allocations made, budgets finalized

July 2023

- TEG Mtg: Use of WERI Tools (maps and database navigation, application, 4th Quarter, FY2023)

August 2023

- Legislature acts on GovGuam FY2023 budget
- Final CWMP and GHS plans/budget presented to Legislature per PL 24-161, 247