**RESOLUTION NO. 164-23**
**OF THE GOVERNING BODY OF THE**
**YAVAPAI-APACHE NATION**

**A Resolution Approving Amendment No. 1 to Yavapai-Apache Nation Contract for Consulting Services with Dr. Laurel Lacher, dba Lacher Hydrological Consulting, for the Nation's Drought Resiliency Grant from the Bureau of Reclamation**

**WHEREAS:** The Yavapai-Apache Tribal Council ("Council") is authorized to represent the Yavapai-Apache Nation ("Nation") and act on all matters that concern the health and welfare of the Nation, and to make decisions not inconsistent with or contrary to the Constitution of the Yavapai-Apache Nation ("Constitution") as provided by Article V (a) of the Constitution; and

**WHEREAS:** The Council, as the legislative body of the Nation, is authorized to enact laws, ordinances, and resolutions incidental to the exercise of its legislative powers as provided by Article V(v) of the Constitution; and

**WHEREAS:** The Council is authorized to appropriate and regulate the use of the Nation's funds, as provided by Article V (k) of the Constitution; and

**WHEREAS:** The Nation's water resources provide a critical water supply in support of the Nation's permanent tribal homeland needs; and

**WHEREAS:** As authorized by Council Resolution No. 60-22, dated April 14, 2022, the Nation applied to the Bureau of Reclamation, Native American Affairs Program ("Reclamation"), for grant funding under the Extending Government Funding and Delivering Emergency Assistance Act (P.L. 117-93) to provide drought resilience and mitigation assistance to federally recognized Indian Tribes in the 17 western states ("Drought Resiliency Grant"); and

**WHEREAS:** The Nation received notification from Reclamation that it was awarded a Drought Resiliency Grant based upon the Nation's application; and

**WHEREAS:** In anticipation of the formal grant award, the Nation was authorized to incur up to $15,000.00 in pre-award costs that were then allocated to Dr. Laurel Lacher as approved by Resolution No. 41-2023 dated March 2, 2023, under the Council-approved Yavapai-Apache Nation Contract for Consulting Services (Laurel Lacher dba Lacher Hydrological Consulting - YAN BOR Drought Resiliency Project) ("Consulting Contract"); and

**WHEREAS:** On September 5, 2023, the Bureau of Reclamation officially awarded Grant No. R23AP00542-00 to the Nation; and

**WHEREAS:** Dr. Laurel Lacher dba Lacher Hydrological Consulting (Lacher) is specially qualified to complete certain of the work required by the Nation's Drought Resiliency Grant with the Bureau of Reclamation, and Dr. Lacher has agreed to perform the work in accordance with the Terms and Conditions of the Consulting Contract and Amendment No. 1 to the Yavapai-Apache Nation Contract for

Consulting Services (YAN – BOR Drought Resiliency Project), in the form attached hereto and incorporated herein by reference as **Exhibit A**; and

**WHEREAS:** The services to be performed by Dr. Lacher are unique services that can only be performed by Dr. Lacher due to her specialized knowledge and skill as it relates to the Nation's water resources and related matters; and

**WHEREAS:** The Council has determined that the fees, expenses, and costs arising under the Consulting Contract, and any amendments thereto with Dr. Lacher, including any of the previously authorized pre-award costs, shall be paid from the grant funds awarded by Reclamation for the Drought Resiliency Grant No. R23AP00542-00; and

**WHEREAS:** All fees, expenses, and costs paid under the Consulting Contract and any amendments thereto, including pre-award costs heretofore incurred under the Consulting Contract, shall be capped at **$248,400.00,** unless otherwise provided by the Tribal Council in an amendment to said Contract; and

**WHEREAS:** The term of the Consulting Contract, as previously approved by the Council, shall be extended for the period beginning February 1, 2023, and ending on September 30, 2025, subject to all terms and conditions required by the Drought Resiliency Grant; and

**WHERAS:** The Council has reviewed Amendment No. 1 to the Nation's Consulting Contract with Dr. Lacher, attached to this Resolution as **Exhibit A**, and deems it to be in the Nation's best interest to approve Amendment No. 1 to the Contract in accordance with its Terms and Conditions.

**NOW THEREFORE BE IT RESOLVED** that the Yavapai-Apache Tribal Council, in Council assembled, at which a quorum is present, hereby approves Amendment No. 1 to the Consulting Contract with Laurel Lacher dba Lacher Hydrological Consulting, in the form attached to this Resolution as **Exhibit A**, and in accordance with its Terms and Conditions.

**BE IT FURTHER RESOLVED** that the Tribal Council directs that all fees, expenses, and costs arising under the Consulting Contract and any amendments thereto with Dr. Lacher, including all previously authorized pre-award costs, shall be paid from the grant funds awarded by Reclamation for the Drought Resiliency Grant No. R23AP00542-00.

**BE IT FURTHER RESOLVED** that the Tribal Council directs that all services provided by Dr. Lacher under the Consulting Contract shall be reviewed by and coordinated through the Nation's Office of Attorney General.

**BE IT FURTHER RESOLVED** that the Chairwoman, Vice-Chairman, or either of them, are authorized to execute the attached Amendment No. 1 to the Consulting Contract on behalf of the Nation, and to execute any future amendments to the Consulting Contract that provide for no-cost time extensions to the performance period of the Consulting Contract, as necessary to accomplish the project objectives and in accordance with any terms and conditions of the Drought Resiliency Grant. However, any future amendments to the Contract that include a modification of the Contract amount shall require Tribal Council approval.

**BE IT FINALLY RESOLVED** that the Chairwoman, Vice-Chairman, or either of them, are hereby authorized to take such further action as deemed necessary to carry out the intent and purposes of this resolution.

## CERTIFICATION

I hereby certify that the foregoing resolution was adopted by an affirmative vote of the Tribal Council, presented for approval on September 28, 2023, by a vote of 9 in favor, 0 opposed and 0 abstaining, pursuant to the authority contained under the Constitution of the Yavapai-Apache Nation.

for
Tanya Lewis, Chairwoman

**ATTEST:**

Karla Reimer
Karla Reimer, Council Secretary

Approved as to Form:

Scott Cuny
Attorney General

# EXHIBIT A

**AMENDMENT NO. 1**
**TO**
**YAVAPAI-APACHE NATION**
**CONTRACT**
**for**
**CONSULTING SERVICES**

**(Laurel Lacher dba Lacher Hydrological Consulting – YAN BOR Drought Resiliency Project)**

September 28, 2023

**AMENDMENT NO. 1**
**TO**
**YAVAPAI-APACHE NATION**
**CONTRACT**
**for**
**CONSULTING SERVICES**
**(Laurel Lacher dba Lacher Hydrological Consulting – YAN BOR Drought Resiliency Project)**

The Yavapai-Apache Nation Contract for Consulting Services (Laurel Lacher dba Lacher Hydrological Consulting – YAN BOR Drought Resiliency Project) as approved by Tribal Council Resolution No. 41-2023 dated March 2, 2023 (Contract), is hereby amended as follows:

1. The Term of the Contract as stated in Paragraph 1. shall be for the period:

   **February 1, 2023 (the "Effective Date")** through **September 30, 2025**

2. The Scope of Services and Budget as stated in Paragraph 2. shall be for the work described in the the *Scope of Services and Budget* attached hereto and incorporated herein by reference as **Exhibit A.**

3. The Budget Cap, as stated in **Exhibit A**, shall be **$248,400.00.**

4. Consultant acknowledges having received and reviewed the terms and conditions of the Bureau of Reclamation Grant No. R23AP00542-00, and Consultant agrees to comply with all terms and conditions included therein, as is required of all contractors and/or subcontractors in the performance of the work described in **Exhibit A.**

5. All sums paid to Consultant under the Scope of Services and Budget shall be charged by the Nation to the Bureau of Reclamation Grant No. R23AP00542-00.

6. All other terms and conditions of the Contract shall remain unchanged and fully effective.

**IN WITNESS WHEREOF**, the parties have executed this Amendment No. 1 to the Contract as follows:

**YAVAPAI-APACHE NATION**

By _____
Tanya Lewis, Chairwoman

Date 9-28-2023

**DR. LAUREL LACHER dba LACHER HYDROLOGICAL CONSULTING**

By _____
Dr. Laurel Lacher

Date _____

**Approved as to Form:**

_____
Attorney General – Yavapai-Apache Nation

**Exhibit A**
**Scope of Services and Budget**
**(Laurel Lacher dba Lacher Hydrological Consulting – YAN BOR Drought Resiliency Project)**

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## Scope of Services

Consultant, in coordination with any necessary subconsultants, will complete Task Nos. 3, 4, and 5 as described in the Yavapai-Apache Nation Drought Preparedness and Resilience Project Scope of Work, attached hereto and incorporated by reference.

## Budget

| **Task 3: Monitoring Wells** | | | | |
|---|---|---|---|---|
| Budget Item Description | Computation $/UNIT | UNIT | QUANTITY | Reclamation Total Cost |
| SUPPLIES/MATERIALS | | | | |
| Pressure transducers for water-level monitoring | 1,000 | ea | 4 | $4,000.00 |
| Misc. installation materials | 200 | ea | 4 | $800.00 |
| CONTRACTUAL | | | | |
| Consulting Hydrologist - siting, design, and construction supervision of wells | 160 | hr | 100 | $16,000.00 |
| Consultant travel exp (10 days lodging in Camp Verde+mileage+per diem) | 3000 | LS | 1 | $3,000.00 |
| Environmental/Regulatory/NEPA Compliance | 160 | hr | 100 | $16,000.00 |
| Drilling Contractor (Monit. Wells Materials & Construction) | 26225 | ea | 4 | $104,900.00 |
| | | | **TASK TOTAL :** | **$144,700.00** |
| **Task 4: Floodplain Restoration / Rehabilitation Plan** | | | | |
| Budget Item Description | Computation $/UNIT | UNIT | QUANTITY | Reclamation Total Cost |
| CONTRACTUAL | | | | |
| Restoration Ecologist | 160 | hr | 300 | $48,000.00 |
| Hydrology/Water Rights Consultant | 160 | hr | 40 | $6,400.00 |
| Ethnobotanist Consultant | 150 | hr | 10 | $1,500.00 |
| | | | **TASK TOTAL :** | **$55,900.00** |
| **Task 5: Integrated Modeling Scenarios** | | | | |
| Budget Item Description | Computation $/UNIT | UNIT | QUANTITY | Reclamation Total Cost |
| CONTRACTUAL | | | | |
| Water Res. Engineer/Modeling Consultant | 175 | hr | 200 | $35,000.00 |
| Hydrology/Water Rights Consultant | 160 | hr | 80 | $12,800.00 |
| | | | | |
| | | | **TASK TOTAL :** | **$47,800.00** |
| | | | **TOTAL BUDGET CAP:** | **$248,400.00** |

## Schedule

| Task | Completion Date |
|---|---|
| Task 3 (Monitoring Wells): | 9/15/2024 |
| Task 4 (Floodplain Restoration / Rehabilitation Plan: | 12/15/2024 |
| Task 5 (Integrated Modeling Scenarios): | 9/15/2025 |

# YAVAPAI-APACHE NATION
# DROUGHT PREPAREDNESS AND RESILIENCE PROJECT

Yavapai-Apache Reservation
Camp Verde, Arizona

## SCOPE OF WORK

## BACKGROUND

The Yavapai-Apache Nation (Nation) is a federally recognized Indian Tribe with a Reservation consisting of more than 1,800 acres located in central Arizona in the Verde Valley, within and near the communities of Camp Verde and Clarkdale, Arizona (Figure 1). The Nation's Reservation consists of five (5) separate Districts: Camp Verde, Middle Verde, Clarkdale, Rimrock, and Montezuma/I-17. The Nation currently has more than 2,600 enrolled Tribal members.

The Middle Verde District of the Yavapai-Apache Reservation, which is the largest District of the Reservation, is bifurcated by the Verde River. The Verde River is physically and spiritually the "heart" of the Nation. Tribal members report witnessing a narrowing and channelization of their river compared with its historic condition, and streamflow data and satellite imagery support their perception (Figure 2). The Verde Valley has experienced several muti-year droughts in the past 30 years, as shown in Figure 3. Figure 4 shows trends in average annual and average monthly temperature, precipitation, and Verde River flows for five periods: 1950-2019, 1960-2019, 1970-2019, and 1980-2019. The green bars in the bottom graph show percent change in annual streamflow for each period (left end of plot) and for monthly streamflow for each month. The five green bars in April show changes of -40 to -80%, indicating a strong decline in flows over every time period. Only the months of December, January, and February show declines less than 40% or (slight increases) for all time periods. Decreases in autumn and spring streamflow reflect warming temperatures and some decreases in spring precipitation (Woodhouse & Udall, 2022). Figure 5 shows the declining trend in total annual streamflow measured at the Verde River above Horseshoe Dam (Woodhouse & Ferguson, 2016).

Woodhouse & Ferguson (2016) report warming of 0.33°F per decade in spring and 0.29°F per decade in summer over the period 1914-2015, but "no evidence of long-term trends in precipitation or snow-water equivalent." They note that declining streamflow trend is largely a function of high flows in the early 1900's as well as warming temperatures that increase evapotranspiration (ET) in spring and summer.

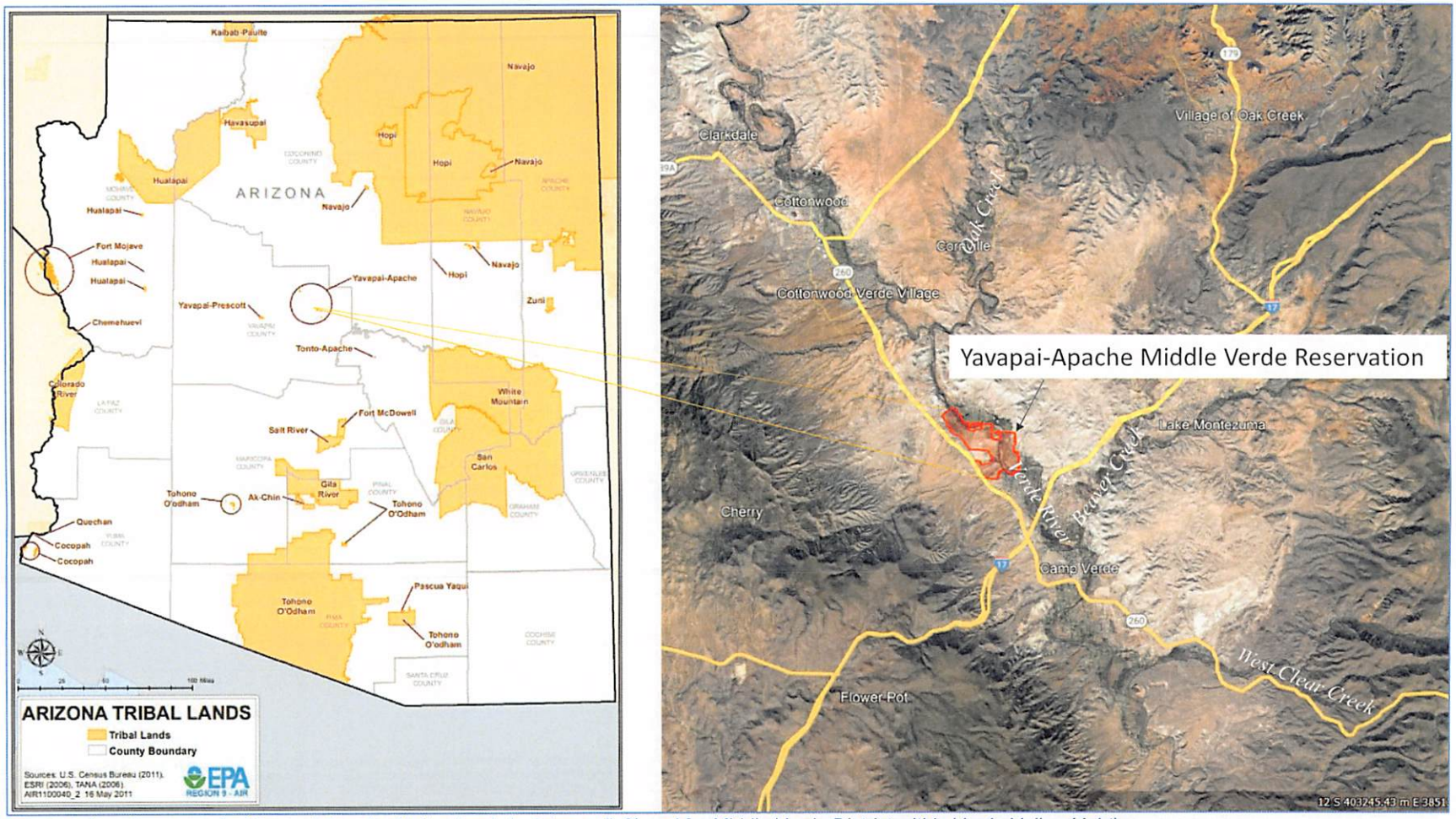


*Figure 1. Location maps for Yavapai-Apache Nation lands in Arizona (left) and for Middle Verde District within Verde Valley (right).*

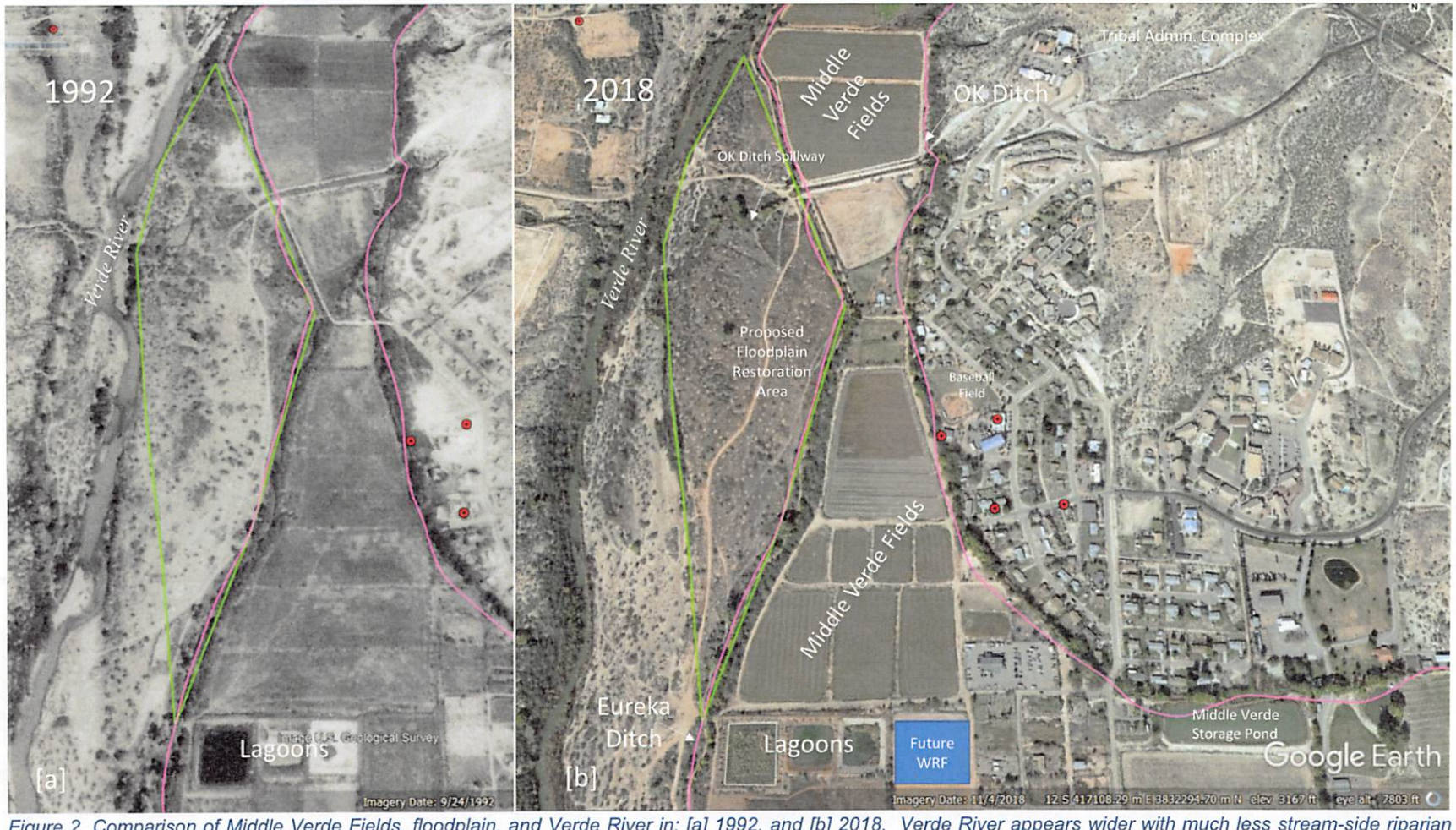


*Figure 2. Comparison of Middle Verde Fields, floodplain, and Verde River in: [a] 1992, and [b] 2018. Verde River appears wider with much less stream-side riparian vegetation in 1992. Proposed area for floodplain restoration project is outlined in green polygon. Red filled circles are Middle Verde municipal wells.*

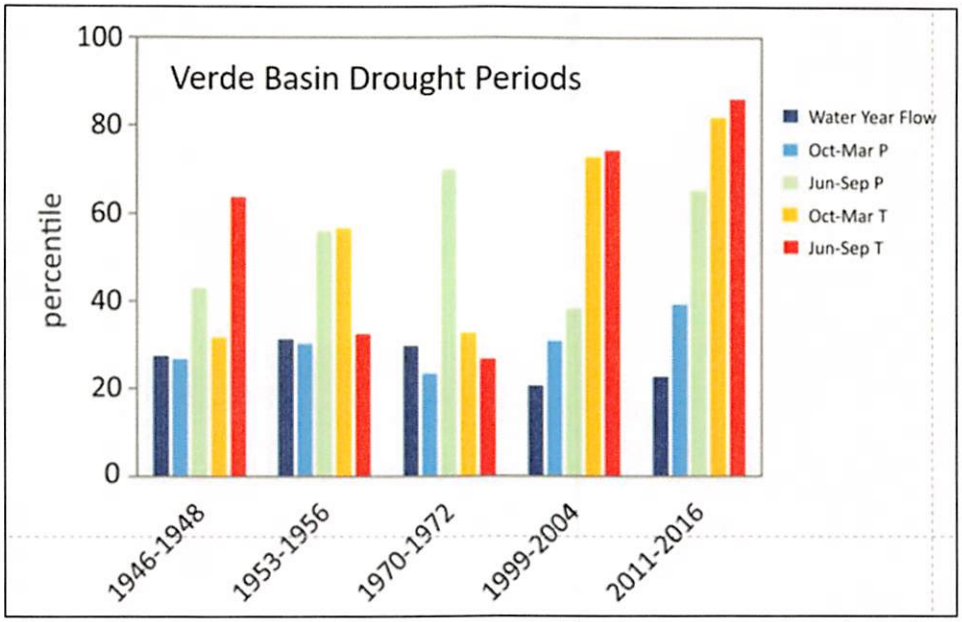


*Figure 3. Multiyear droughts in the Verde River gauge record, with water-year streamflow, along with cool-season and monsoon precipitation and temperatures, averaged for the years in each period of drought for the Verde River. Values are in percentile and are color coded to correspond to the different variables. (Adapted from Figure 8 in Woodhouse and Udall, 2022).*

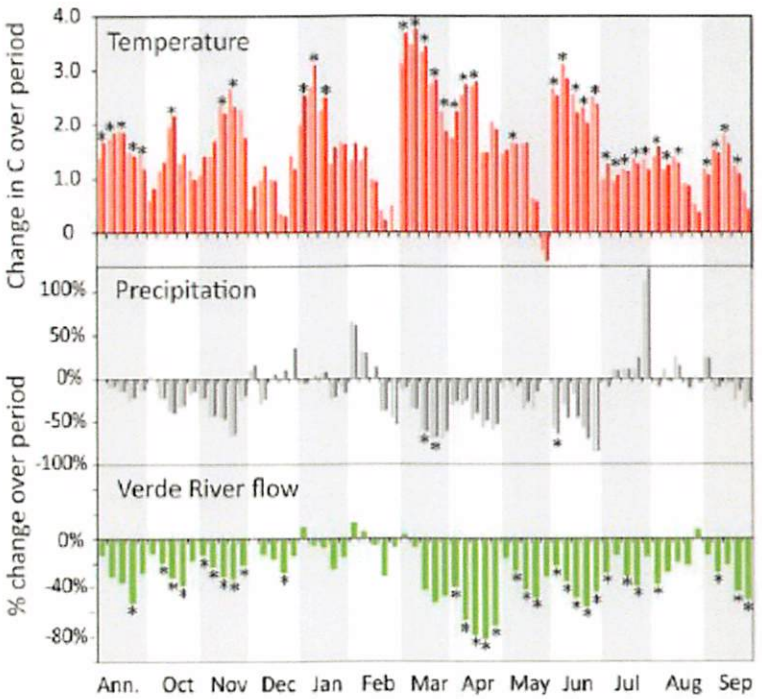


*Figure 4. Trends in monthly temperature, precipitation, and streamflow for the Verde River annual and monthly values, for five periods (1950–2019, 1960–2019, 1970–2019, 1980–2019, and 1990–2019). Temperature trends are changes in degrees Celsius over the period. Precipitation and streamflow trends are percent change over the period. Values with asterisks are months with significant trends at p , 0.05 for both datasets. (Adapted from Figure 9 in Woodhouse and Udall, 2022).*

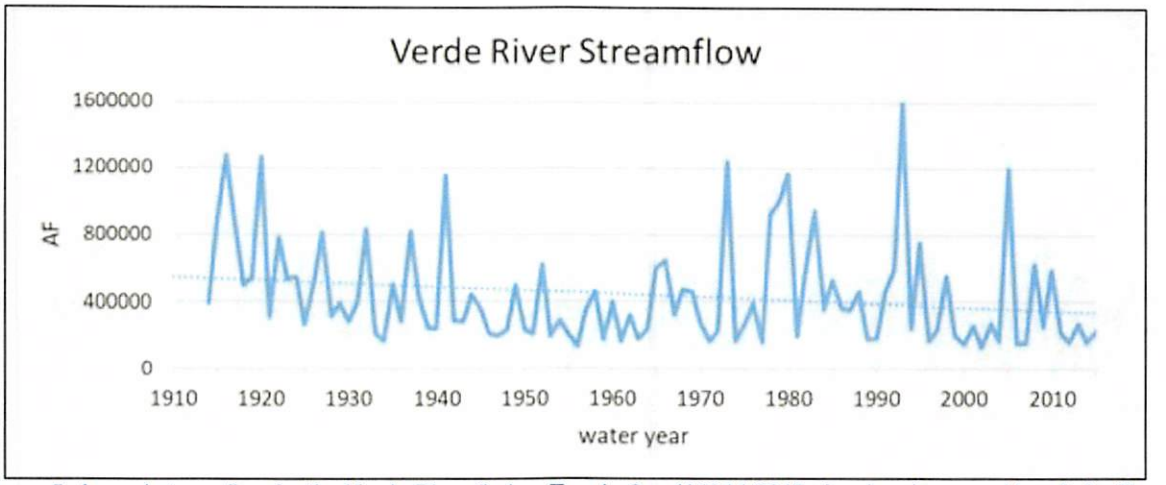


*Figure 5. Annual streamflow for the Verde River (below Tangle Creek)1914-2015 showing downward trend significant at the 93% level.*

Cool-season precipitation is the most important climate variable in explaining decreasing streamflow in the Verde River (Woodhouse & Ferguson, 2016). While future precipitation trends are highly uncertain, climate change is predicted to increase temperatures year-round in the Verde Basin (Figure 6), thereby decreasing snowpack and increasing ET in spring, summer, and fall. While strong monsoons often follow dry winters in the Verde Basin, because of high ET rates in summer months, they typically can't make up for the impact of dry winters on Verde River annual streamflow (Woodhouse & Udall, 2022).


*Figure 6. Forecast monthly average maximum temperature 2060-2090 for compared with observed historic values* [https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=8b910d9c7b9744ea94e07d82f5420782](https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=8b910d9c7b9744ea94e07d82f5420782)

In addition to the threats from climate change and ongoing drought, the Nation faces threats to its groundwater supplies. Presently, the Nation relies entirely on groundwater for its municipal supplies. The Middle Verde District of the Reservation produces the public water supply from three wells just south of the ball field (red circles shown in Figure 2). The entire west side of the Middle Verde District also relies on groundwater for agricultural irrigation and industrial use at the Nation's Sand and Gravel operation. Groundwater supplies depend on recharge from precipitation and, to some extent, seepage from the Verde River. With reduced natural recharge from increasing temperatures and no regulation of groundwater pumping in the Verde Basin, the Nation's groundwater supplies are at risk from both drought/climate change and pumping by wells outside of its Reservation boundaries.

## A. NEED FOR ACTIVITY

### 1. CONJUNCTIVE WATER MANAGEMENT

The Nation is facing historic threats to its flowing Verde River and its groundwater supplies. The development of the Nation's new Water Reclamation Facility (WRF) near the existing wastewater lagoons (see Figure 2b) will provide roughly 75 acre-feet per year (AF/yr) of Class A+ reclaimed water initially and up to 150 AF/yr in the future at full build-out of the Middle Verde District (A. Esmay, Carollo Engineering, pers. comm.). This reclaimed water constitutes a new supply for the Middle Verde District because it will "salvage" water that would otherwise be lost to evaporation in the lagoons.

In addition to its reclaimed water, the Nation will need to redirect some of its current OK Ditch irrigation water use that is offset by the application of reclaimed water to the Middle Verde fields. The Nation currently uses potable water produced from its Middle Verde wells to irrigate its baseball field. Many residents in the Middle Verde community water lawns with their municipal water supply, as well.

Because the Nation's groundwater supply is naturally high in arsenic, it requires expensive treatment for arsenic removal prior to potable use. To protect the Nation's vulnerable and expensive potable water supply, municipal irrigation with treated groundwater should be phased out and replaced with another source of irrigation water to the extent possible. While the Nation's new reclaimed water supply is envisioned primarily for crop irrigation on the Middle Verde District fields, the need to rotate this supply across various fields every four years and to manage the reclaimed water during the non-irrigation season requires a detailed Water Management Plan to assist the Nation in its conjunctive management of this supply and its other irrigation and municipal supplies.

### 2. IMPROVED IRRIGATION EFFICIENCIES

Like most agricultural lands in the Verde Valley, most of the Middle Verde fields are presently irrigated via flood irrigation from a ditch diverting Verde River water. The Nation has historic water rights to the OK Ditch in the Middle Verde District east of the Verde River. As temperatures increase with climate change, flows diverted from the Verde River for irrigation will increasingly impact river flows during the warm months. Because the

Nation values both its irrigation water supply and a flowing Verde River, improving irrigation efficiencies is one of the most productive ways to reduce the Nation's irrigation-related impacts on the river. As a first step to improving irrigation efficiencies, the Nation is currently working on a Farm Plan that is reviewing and considering changes to the Farm's irrigation infrastructure to both improve efficiencies and to integrate reclaimed water produced by the Nation's wastewater treatment plants into the Nation's Farming operation. As the recommendations for these improvements are made, the Nation requires design and engineering services to prepare the plans for these improvements. This Project will fund the completion of those plans which will allow the Nation to then seek out construction funding.

In addition, the Nation desires to install irrigation water meters and employ better irrigation controls with a Supervisory Control and Data Acquisition (SCADA) system in order to enhance the Nation's ability to precisely manage and conserve its conjunctively managed supplies of reclaimed and ditch water on the Middle Verde fields. However, because the Farm Plan will likely result in recommendations for changes to the existing Farm irrigation system, a layout for a SCADA system will be prepared as part of this Project. The layout will then provide a basis for the Nation to seek out additional funding to install the SCADA system which will ultimately allow Farm management to remotely monitor when water is being applied to different farming areas, see how much water is being applied to those areas, manage effluent water in concert with their agricultural operations, and allow the overall calculation of water usage.

An finally, in order to begin collecting data on the Farm's existing irrigation use, seven (7) SCADA-ready flow meters will be installed that will begin to account for the Nation's agricultural water use on its fields. With this knowledge, the Farm will be able to better understand its water usage in order to make plans for improvements to its conservation practices.

### 3. Floodplain Rehabilitation / Riparian Habitat Restoration

The Verde River floodplain within the project area (green polygon in Figure 2) consists of two terraces: a low-set active floodplain that is prone to periodic seasonal inundation and an upper, historic floodplain that no longer inundates except potentially under extreme flood conditions. The low-set active floodplain is currently dominated by reproducing populations of native Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*). These vegetation communities established sometime in the late 1990's after the Tribe excluded livestock grazing from the area. Other than the need for periodic, limited control of non-native saltcedar (*Tamarisk chinensis*) and tree of heaven (*Ailanthus altissima*), the riparian vegetation community on the low-set floodplain is in a healthy functioning condition and provides habitat for a wide-diversity of wildlife species, including federally listed threatened and endangered (T&E) species.

The upper floodplain terrace, on the other hand, is relatively devoid of native vegetation. This upper terrace was heavily grazed by livestock for at least several decades and field conditions indicate the native seedbank has been denuded. The absence of a natural seedbank combined with sandy soils and prolonged drought conditions is driving this site towards desertification. Furthermore, the high albedo of the barren soils creates a local

"heat-island" that directly increases the temperatures of the surrounding residential areas. These conditions can be reversed through sustainable and culturally appropriate land management techniques.

This Project will develop a sustainable rehabilitation plan for a 51-acre portion of this desertified floodplain terrace. The rehabilitation planning objectives are to design a resilient revegetation program that emphasizes stabilizing soils, building/sequestering carbon, regulating local temperatures, and ensuring drought resiliency while also supporting the Nation's cultural and social values.

### 4. Integrated Hydrologic Modeling

In order to understand the potential impacts of its conjunctive-use water management strategies, the Nation must understand current hydrologic conditions on its Middle Verde District and, by extension, within the Verde Valley. Decisions about how to use water and to what benefit, will be driven by a fundamental understanding of the dynamics between groundwater and surface water. For example, groundwater recharge to the shallow alluvium may be a viable strategy for "banking" water during the cool (non-irrigation) season. Understanding the fate of any recharged water, however, requires knowledge of the aquifer characteristics, including depth to water and the nature of the hydrologic connection between the Verde River and the underlying alluvial aquifer. Is the river contributing recharge to the aquifer? If so, at what rate? Is the aquifer recovering seasonally from summer ET and pumping stresses? Does the Nation's pumping impact the alluvial aquifer and/or the Verde River? How significant are potential threats to the Nation's groundwater supplies from off-reservation pumping?

The Nation seeks to ensure a flowing Verde River and reliable groundwater under its lands in perpetuity. Running integrated model scenarios to compare optional management strategies and to account for predicted impacts of climate change and ongoing drought will be central to the Nation's successful water resources management.

## B. Proposed Scope of Activity

### Task 1: Water Management Plan

Directors from the Nation's natural resources departments (Environmental Protection Department (Tribal EPA), Tribal Farm (Agriculture Department), Utility, and Recreation) will provide guidance to the water resources consultant tasked with developing the Nation's Water Management Plan (WMP). This consultant will work closely with the Nation's leadership including the Tribal Council and legal team, its water rights attorneys, and its hydrology and infrastructure consultants to ensure that the plan considers all necessary aspects of the Nation's water supply in the near and long term. The WMP will provide crucial guidance in conjunctively managing reclaimed, surface (ditch) water, and groundwater resources to support the Nation's objectives. These objectives will be fully articulated as part of the early planning process. The WMP structure will be flexible to allow for growth in both the Nation's demands and supplies and to accommodate and facilitate conjunctive management of its various water supplies in response to time-varying demands and supply availability.

### TASK 2: ON-FARM IRRIGATION SYSTEM DESIGN AND ENGINEERING, SCADA SYSTEM LAYOUT AND FLOW METER INSTALLATION

The Nation is currently preparing a Farm Plan with the assistance of its Farm Consultant. As part of the Farm Plan, the Farm Consultant will be creating a recommended layout of the Nation's entire on-farm irrigation system to improve irrigation efficiency while also integrating the Nation's reclaimed water into farming operations from the Nation's existing Tunlii Wastewater Reclamation Facility (Tunlii WRF) and from its new Middle Verde Wastewater Reclamation Facility (MVWRF) which will be constructed during 2024 and come into operation by May 2025. Upon completion and approval of the Farm Plan by the Nation's Council (which is expected by December 2023), under this scope of work, the Farm Consultant will prepare the designs, plans, specifications and cost estimates for the infrastructure needed to improve irrigation efficiencies and integrate the Nation's reclaimed water into Farm operations. This task will also include the installation of up to seven (7) flow meters on the Reservation to account for water use on the Tribal Farm. This task will facilitate the Nation's ability to seek out additional funds for the construction of the irrigation and SCADA system ultimately needed to improve irrigation efficiency in the Nation's farming operations.

### TASK 3: MONITORING WELLS

Data gaps in the hydrogeology of the Middle Verde District area limit the Nation's ability to understand the surface water and groundwater systems there. Better understanding key facets of the local hydrogeology such as depth to groundwater, alluvial aquifer extent and seasonal variations in saturation, and the nature of the hydraulic connectivity between the river and the underlying aquifer will vastly improve the Nation's ability to simulate the state of its water supplies under varying management and climate conditions. Installing four (4) small-diameter, relatively shallow (< 100 ft) monitoring wells within the lower floodplain adjacent to the Verde River within the Middle Verde District will provide important data to improve local calibration of the Nation's integrated hydrologic models in this area and will help guide future water management decisions.

### TASK 4: FLOODPLAIN RESTORATION / REHABILITATION PLAN

The Nation's staff and leadership support a floodplain restoration/rehabilitation effort in the proposed project area outlined in the green polygon of Figure 2. A regional expert in riparian and floodplain restoration and rehabilitation, Mr. Todd Caplan of GeoSystems Analysis, Inc. in Albuquerque, visited the site with tribal staff and provided his initial assessment of site and its potential for rehabilitation (see discussion in "Need for Activity" section above). The Nation's representatives expressed various desires for features of a rehabilitation plan, including improved recreation opportunities near the river, reduction of invasive species and increasing native species, possible cultivation of culturally significant species in a flood-resilient irrigated plot, groundwater recharge, and further protection of the immature, yet thriving, riparian forest along the banks of the Verde River. The Nation's floodplain rehabilitation specialist consultant will integrate these and other Tribal objectives with information gained from in-situ soils investigations (shallow borings), existing plant inventories, and hydrologic data developed from the monitoring

well installation (Task 2) into a comprehensive floodplain rehabilitation plan for part or all of the site shown in Figure 2.

### TASK 5: DEVELOP AND SIMULATE INTEGRATED MODELING SCENARIOS

The Nation's hydrology and water resources engineering modeling experts have developed the Nation's Verde Valley-Oak Creek and Verde Basin MIKESHE integrated hydrologic models. Working closely with Nation's department heads, leadership, and water rights attorneys, the Nation's modeling experts will define and implement water management scenarios designed to facilitate water planning and management on the Middle Verde District. This effort will work iteratively with Task 1 (Develop a Water Management Plan) to ensure that strategies identified for conjunctively managing the Nation's water supplies will be likely to achieve the desired outcomes based on the best available science. The modeling effort will consider anticipated future conditions such as: a) changing climate conditions, b) increased groundwater development associated with population growth in the Verde Basin, c) potential for groundwater recharge to support a flowing Verde River. Data obtained through the installation of monitoring wells (Task 3) will provide key data for improving model predictive performance in the Middle Verde District of the Reservation.

## C. ANTICIPATED RESULTS/BENEFITS

All of the proposed activities (Tasks) in this study will ultimately strengthen the Nation's water resource management capacity and help secure the Nation's water future.

The overarching framework for the Nation's conjunctive water management lies in its **Water Management Plan (Task 1)**. This Plan will evolve as a central information repository for the management of the Nation's water resources. Each major water supply source of the Nation will be documented and linked to a catalog of the Nation's water resources needs and objectives. The Plan will adapt and grow, as needed, with the Nation's water management capacity and supply. Having a central warehouse for water resources management strategies and objectives will greatly facilitate the Nation's budgeting and planning for personnel and environmental and other water-related permitting and compliance requirements. With careful coordination and planning, as new water sources come online (*e.g.,* the new Middle Verde WRF or a groundwater recharge facility), these sources will already be accounted for in the conjunctive water use practices employed by the Nation. Likewise, new water demands (such as from a change in cropping pattern or new industry) will be anticipated and the supplies to meet those demands will be identified before the demand exists. This planning is particularly important for domestic/municipal growth so that the Nation has a secure and stable water supply to protect human health. Future urban landscaping irrigation demands can be coordinated with future reclaimed water supplies to avoid using highly treated, non-renewable groundwater supplies for consumptive uses.

Successful implementation of water management strategies will depend on adequate staffing and infrastructure to measure and control water deliveries and demands. The proposed **Irrigation System Design and Engineering, SCADA System Layout and Flow Meters (Task 2)** for the Tribal Farm will play a critical role in preparing the Farm to

reduce on-farm water use while improving crop productivity by limiting over- and underwatering.

Better information on the impacts of the Nation's water management strategies can be developed by gathering more hydrogeologic data in the area between the Verde River and the Middle Verde District community. Well logs and water-level elevation over time provided by **new monitoring wells (Task 3)** will be the first such data collected on the Middle Verde District. These data will provide critical, ongoing information about the way that stresses on the groundwater system (eg, pumping) impact Verde River flows and how the Verde River flows affect shallow groundwater levels. The information, combined with test-pit data acquired by the YAN in March of 2023 in the upper floodplain will inform the **floodplain rehabilitation planning effort (Task 4)** by identifying any potential barriers to groundwater recharge (such as clay units) and providing information about irrigation drainage potential. The monitoring wells will also provide critical information for improving the local calibration of the Nation's integrated hydrological MIKESHE models in the Middle Verde area. Improving the accuracy of the predictive capacity of the Nation's Verde Valley-Oak Creek model will be vital to producing reliable output from **water management modeling scenarios (Task 5).** The monitoring wells will also provide an opportunity to monitor water quality in support of reclaimed water management and compliance permitting.

## D. PROJECT IMPLEMENTATION / SCOPE OF WORK

### TASK 1: WATER MANAGEMENT PLAN (WMP)

A professional water resources consultant will review documents, gather data, and solicit expert knowledge about the Nation's water supplies and water delivery systems. This consultant will meet with all relevant Tribal departments as well as the Tribal Council (including Chairman and Vice-Chairwoman), legal department, water rights attorneys, and hydrology and modeling expert consultants to develop a WMP framework. The consultant will prepare a draft Yavapai-Apache Nation Water Management Plan for review and comment by the Nation. The consultant will address any comments in the final Yavapai-Apache Nation Water Management Plan. The Tribal Council will review and approve the final Yavapai-Apache Nation Water Management Plan by Council resolution.

**DELIVERABLE**: Yavapai-Apache Nation Water Management Plan

### TASK 2: ON-FARM IRRIGATION SYSTEM DESIGN AND ENGINEERING, SCADA SYSTEM LAYOUT AND FLOW METER INSTALLATION

The Nation is currently preparing a Farm Plan with the assistance of its Farm Consultant. As part of the Farm Plan, the Farm Consultant will be creating a recommended layout of the Nation's entire on-farm irrigation system to improve irrigation efficiency while also integrating the Nation's reclaimed water into farming operations from the Nation's existing Tunlii Wastewater Reclamation Facility (Tunlii WRF) and from its new Middle Verde Wastewater Reclamation Facility (MVWRF) which will be constructed during 2024 and come into operation by May 2025. Upon completion and approval of the Farm Plan by the Nation's Council (which is expected by December 2023), the tasks listed in this Task 2

will be undertaken under this Scope of Work.

### TASK 2.1 DESIGN AND ENGINEERING OF TUNLII WRF RECLAIMED WATER IRRIGATION SYSTEM

For this task, the Farm Consultant, who is a qualified engineer, will provide a design, engineering, and construction cost estimate (capital and OM&R) for the on-farm irrigation system components which are necessary to integrate the Tunlii WRF reclaimed water into the Nation's Farm. This includes direct delivery turnouts to irrigated lands along the conveyance of the reclaimed water line, and turnouts to other use areas. Design will include 60%, 90% with an engineers estimate, and 100% percent final for construction submittals. Final submittal will include plans, specifications, and engineers estimate.

The existing pipeline from the Tunlii WRF to the Tunlii Reclaimed Pond at the Nation's Farm (Tunlii Pipeline) has become unreliable and will need to be replaced, as it is subject to frequent breakage which is thought to possibly be caused by a defect in the pipe materials. As part of the design and engineering, work, the Farm Consultant will review the existing pipeline conditions and failure causes, will complete a final hydraulic sizing for the pipeline that will take into account future conditions which presume additional reclaimed water flows as new connections are made, and will incorporate the recommended sizing into the design and engineering of the Tunlii pipeline. The sizing of the Tunlii Reclaimed Pond will also be evaluated, and improvements, if necessary, will be designed as part of this work. Pipeline alignment is assumed to be along the existing alignment (purple line) on Figure 7.

**DELIVERABLE**: Tunlii WRF Reclaimed Water Irrigation System 60/90/100 Design Plans

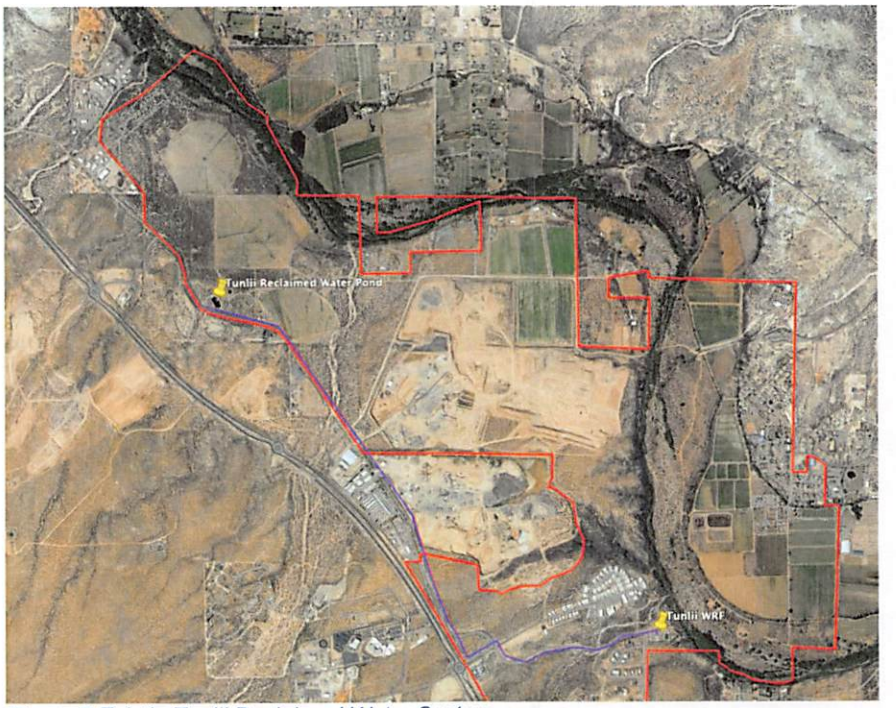


*Figure 7 Existig Tunlii Reclaimed Water System*

## TASK 2.2 DESIGN AND ENGINEERING OF MVWRF RECLAIMED WATER IRRIGATION SYSTEM

For this task, the Farm Consultant, who is a qualified engineer, will provide a design, engineering, and construction cost estimate (capital and OM&R) for the on-farm irrigation system components which are necessary to integrate the MVWRF reclaimed water into the Nation's Farm. This includes direct delivery turnouts to irrigated lands along the conveyance of the reclaimed water, and turnouts to other use areas. Design will include 60%, 90% with an engineers estimate, and 100% percent final for construction submittals. Final submittal will include plans, specifications, and engineers estimate.

**DELIVERABLE**: MVWRF Reclaimed Water Irrigation System 60/90/100 Design Plans

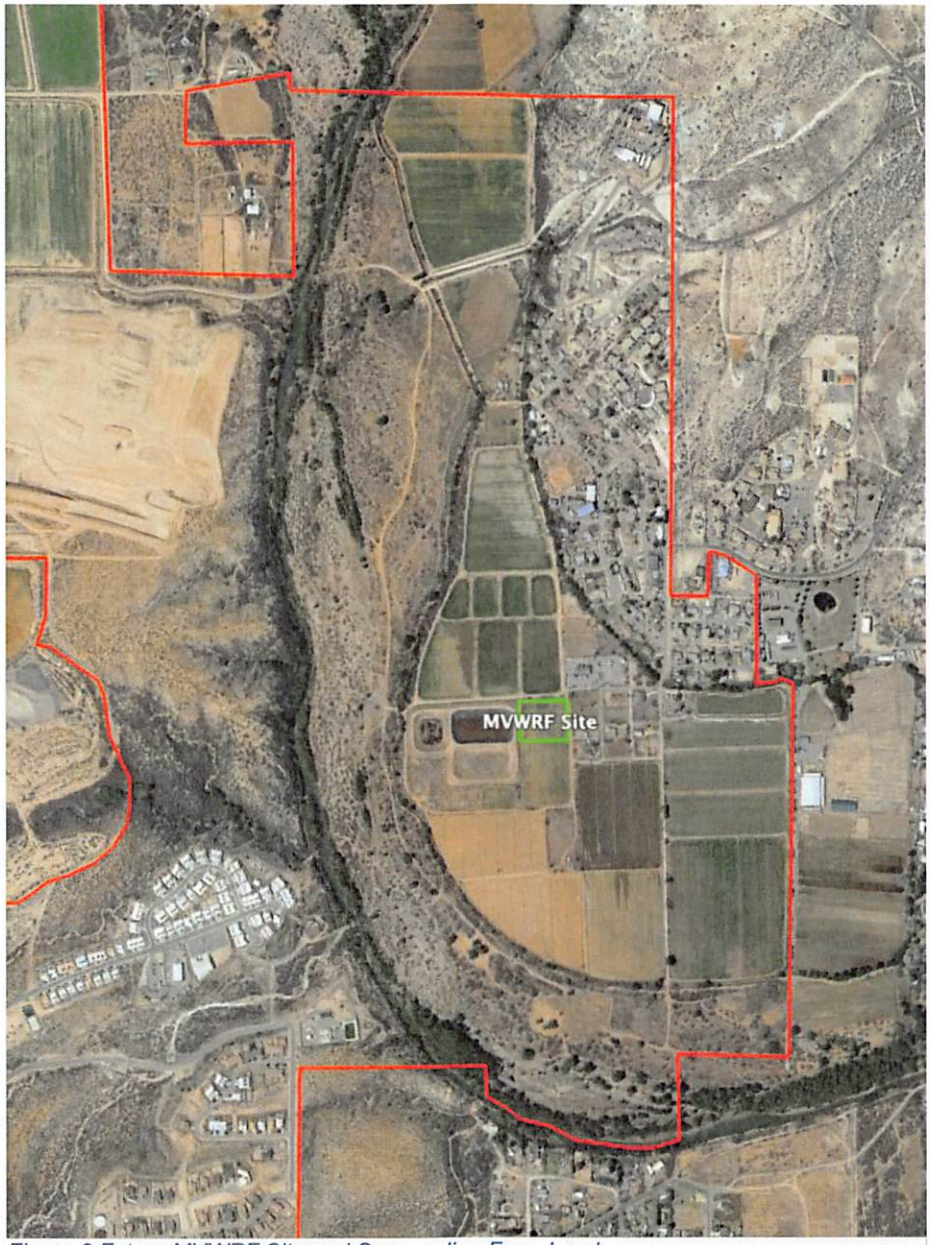


*Figure 8 Future MVWRF Site and Surrounding Farm Lands*

## TASK 2.3 FARM SCADA INTEGRATION PLAN AND INSTALLATION OF FLOW METERS

A flow measurement and SCADA controlled system will be critical for managing the Farm's necessary rotation of water, including reclaimed water, among the fields every four years, and for achieving the optimal growing conditions on the Nation's fields while maximizing water efficiency.

For this task, the Nation's Farm Consultant will prepare a layout, plan and cost-estimate for the installation of a Farm SCADA system. The Nation will also purchase and install seven (7) SCADA-ready flow meters that will account for water use in the Nation's farming operation. The SCADA Integration Plan will form the basis for seeking out additional funding to install the Farm SCADA system in the near future.

While the actual purchase and installation of the SCADA system is not included in this task due to cost, work on this task will ensure that the design and installation of all flow measurement devices and appurtenances will be compatible with the SCADA system that will be installed once funding becomes available. In addition, before the SCADA system is available to be installed, a process for collecting flow meter data will be developed and implemented so that the Farm can begin to document its actual water use and efficiency instead of relying on calculated estimates.

The flow meters will be located at Upper Cloverleaf, Cloverleaf, Keith Wells and Middle Verde fields (Figure 9 below) and may include locations on system lateral headings off the Verde and OK Ditches, or specific locations in the system like bifurcations.

All equipment specified will be SCADA compatible and also coordinated with the transmission and the SCADA backbone installation at the MVWRF Plant. Monitoring of flow meter data will also be incorporated into the MVWRF Plant SCADA, as well as the Farm SCADA.

**DELIVERABLES:** Farm SCADA Layout, Plan and Cost Estimate
Seven (7) SCADA ready flow meters installed

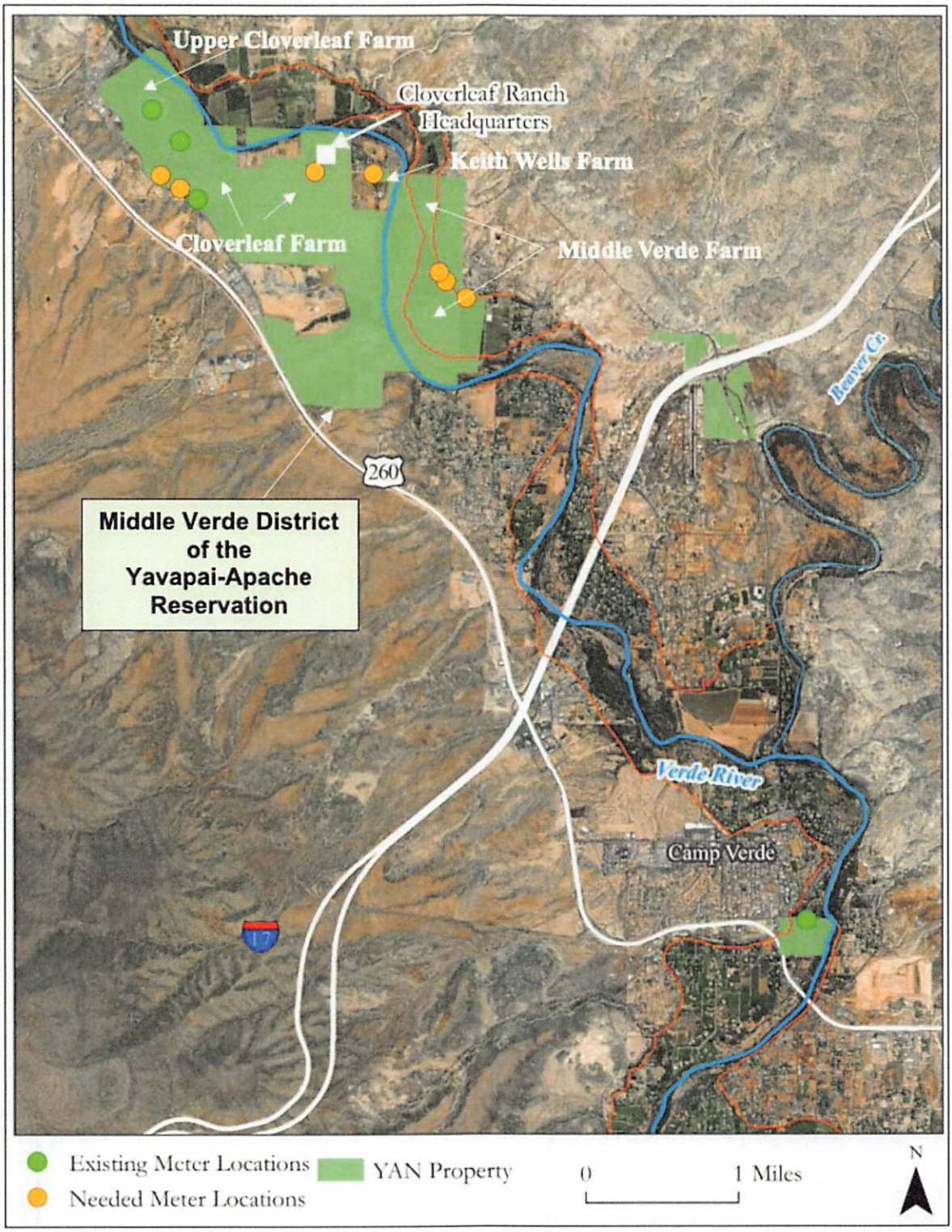


*Figure 9 Proposed Locations of Flow Meters*

**TASK 2.4 PRELIMINARY FARM SCADA SYSTEM PLANNING AND COORDINATION FOR INTEGRATION WITH THE MVWRF SCADA SYSTEM**

This task will include the coordination and planning required for the new Farm SCADA system with the design and development of the MVWRF SCADA system. This includes evaluation and coordination to integrate this system with the Nation's utility meters and SCADA system, if practical and feasible.

Consultant will attend meetings, exchange information, provide equipment specifications, and coordinate communication protocols for a seamless Farm SCADA system with the MVWRF SCADA system. The Farm Consultant will review MVWRF SCADA emergency scenarios and system back-up design and provide written criteria for Farm operational criteria to be integrated with storage and flow control of reclaimed water.

**TASK 2.5 DESIGN AND ENGINEERING OF REMAINING FARM AREAS IDENTIFIED IN FARM PLAN**

Under this task, the Farm Consultant will prepare the designs for the water delivery systems for the remaining irrigation areas of the Nation's Farm which will be identified in the Farm Plan currently under preparation. The design and engineering will particularly focus on water-efficient design and incorporation of reclaimed water, wherever feasible. Design will include 60%, 90% with an engineers estimate, and 100% percent final for construction submittals. Final submittal will include plans, specifications, and engineers estimate.

**DELIVERABLE:** 60/90/100 Design Plans for Irrigation Infrastructure for Remaining Areas of Nation's Farm

**TASK 3: INSTALL MONITORING WELLS**

The Nation's hydrology expert consultant will site and design four (4) monitoring wells to characterize the alluvial aquifer system on the east and west sides of the Verde River within the Middle Verde District. This effort will entail a literature and data review to capture the most current information on depths to water and alluvial aquifer thickness in the area of interest. The consultant will refer to, and employ, ASTM standards for monitoring well design and construction and will develop a bid package with materials and labor specifications for the materials and installation of the wells. The consultant will review plans with appropriate Tribal departments (Utility, Housing, Farm and others that are identified during the design or bid package development process). The hydrology consultant will work closely with the Nation's NEPA coordinator and/or consultant (specialist) to ensure all necessary environmental compliance. The NEPA specialist will work with the U.S. Fish and Wildlife Service to determine and plan for appropriate mitigation measures for any applicable T&E species within the planned drilling areas. The Certificate of Environmental Compliance (CEC) document developed by the NEPA specialist will specify any limitations on timing of well drilling activities to avoid nesting season, and any requirements for an on-site biologist to inspect for T&E species which

may be in the area.

The monitoring wells will be designed to minimize cost while ensuring durability and long-term functionality. The consultant (or other qualified person approved by the Tribal government) will supervise drilling and installation after the drilling contract is awarded and will deliver well completion notes and diagrams for each well. Drilling and installation of four (4) monitoring wells is anticipated to take two to three weeks once materials are on site. The hydrology consultant will instrument each well with a pressure transducer to automatically record water levels over time. The hydrology consultant will work with Tribal EPA staff to train them in routine water-level confirmation measurements and downloading of the transducers on a quarterly basis. A Monitoring Well Installation Summary Report will be prepared to document the task once completed.

**DELIVERABLE:** Monitoring Well Installation Summary Report

**TASK 4: FLOODPLAIN RESTORATION/REHABILITATION PLAN**

To achieve the objectives described in the "Need for Activity" section above, the Floodplain Restoration/Rehabilitation plan will focus on the following tasks:

Mapping/Assessing Soils: This task will involve field verifying existing NRCS soil map units with a particular emphasis on evaluating soil physical (e.g., soil texture, saturated hydraulic conductivity) and chemical (e.g., nutrient availability, cation exchange capacity) characteristics deemed most relevant for developing revegetation prescriptions.

Evaluating Groundwater Table Characteristics: This task will involve coordinating with YAN's hydrologist to obtain information about groundwater depths in the restoration area. The Nation's test-pit study in March 2023 provides key information about groundwater levels throughout much of the upper floodplain target area for this restoration effort. These data are critical for understanding the potential for establishing deep-rooted phreatophytes (e.g., screwbean and/or honey mesquite (*Prosopis spp*)

Developing a Climate-Adapted Planting Pallet: This task will focus on developing a list of site-adapted, native plant species capable of surviving on the site without the need for long-term irrigation. The Tribe has previously performed an ethnobotanical investigation to document regionally native species and their traditional uses. This plant species list will be reviewed to determine which are best adapted to site conditions. This list will be refined and finalized based on a variety of considerations, including, but not limited to cultural value, local seed sources, commercial seed availability, propagation requirements, and climate regulating attributes (e.g., canopy height/cover, carbon sequestration/rooting characteristics, etc.).

Integrating Rehabilitation with Water Use/Re-Use Plans: This task will involve determining irrigation requirements for establishing site-adapted plant communities. Although this rehabilitation will include site-adapted, climate-resilient plant species, irrigation will be required to ensure successful plant establishment. The revegetation specialist will collaborate with other project team members to identify potential and appropriate water sources and water delivery options.

Developing a Floodplain Rehabilitation Plan: This task involves summarizing and applying results of aforementioned tasks into a comprehensive Floodplain Rehabilitation Plan. The implementation plan will describe the rehabilitation plan elements, schedule, sequence, and cost estimates.

A draft Middle Verde Floodplain Rehabilitation Plan will be prepared for review and comment by the Nation. The consultant will incorporate or address any comments and prepare a final Middle Verde Floodplain Rehabilitation Plan to be approved by the Tribal Council by resolution.

**DELIVERABLE**: Middle Verde Floodplain Rehabilitation Plan

**TASK 5: DEVELOP AND SIMULATE INTEGRATED MODELING SCENARIOS**

The Nation's water modeling experts will work closely with the other consultants, Tribal department staffs, and the Nation's water rights attorneys to accurately define model scenarios that will meet the Nation's objectives for exploring water management scenarios to support the Nation's current and future water uses. Part of this effort will entail incorporating new lithology and water-level data from monitoring wells installed under Task 3 as well as soils data developed in Task 4. The consultants will share simulation results and findings with Tribal representatives (staff, Council, legal team) with PowerPoint presentations and other documentation, as needed. The Nation will receive a hard disk with a copy of the MIKESHE integrated model(s) used for the simulations as well as appurtenant data files and presentations of output.

**DELIVERABLE:** PowerPoint Presentation of Water Modeling Scenarios for Middle Verde District and hard disk with MIKESHE model files.

## E. PROJECT PARTNERS/PARTICIPANTS

The Nation does not anticipate having other project partners. However, the Nation has an ongoing cooperative working relationship with The Nature Conservancy (TNC) as it relates to developing strategies to further enhance and protect the flows of the Verde River through water management best practices. Further, the Nation and TNC are co-partners in the creation of the Verde Valley-Oak Creek MIKESHE integrated hydrologic model. Thus, in addition to the Nation's use of its own technical consultants, the Nation expects that it may also interface with TNC, and possibly other local interests, as it relates to the work contemplated in this scope of work. The Nation is not aware of any interests who would be opposed to the work contemplated.

## F. BUDGET DESCRIPTION

The proposed budget and budget detail is attached hereto. Reclamation NAAO Drought Mitigation Program grant funds will be the primary source of funds to carry out the scope of work. The Nation will provide in-kind services to the project through the dedication of its Department staff and attorneys. The value of in-kind services is itemized in the attached budget.

## G. PROJECT SCHEDULE

The Project Schedule is attached. The total duration of the Project is 24 months.

**H. PROJECT MAP.** Maps of the Project area are included above in Figures 1, 2, 7, 8 and 9. The Yavapai-Apache Nation and its Tribal Members will be the community most positively impacted by the work contemplated.

## REFERENCES CITED


Osborne, M. (2022, Feb. 17). The Western U.S. Is Experiencing the Worst Drought in More Than 1,200 Years. *Smithsonian Magazine*.

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Woodhouse, C., & Udall, B. (2022). Upper Gila, Salt, and Verde Rivers: Arid Land Rivers in a Changing Climate. *EARTH INTERACTIONS*, 1-14.