S A W P A

SANTA ANA WATERSHED PROJECT AUTHORITY

11615 Sterling Avenue, Riverside, California 92503 • (951) 354-4220

PURSUANT TO THE PROVISIONS OF EXECUTIVE ORDER N-29-20 ISSUED BY GOVERNOR GAVIN NEWSOM ON MARCH 19, 2020, THIS MEETING WILL BE CONDUCTED VIRTUALLY. ALL VOTES TAKEN DURING THIS VIRTUAL MEETING WILL BE CONDUCTED BY ORAL ROLL CALL.

This meeting will be accessible as follows:

Meeting Access Via Computer (Zoom)*:	**Meeting Access Via Telephone*:**
• https://sawpa.zoom.us/j/99886692331	• 1 (669) 900-6833
• Meeting ID: 998 8669 2331	• Meeting ID: 998 8669 2331
*__Participation in the meeting via the Zoom app (a free download) is strongly encouraged; there is no way to protect your privacy if you elect to call in by phone to the meeting.__	

NOTICE OF REGULAR MEETING OF THE PROJECT AGREEMENT 22 COMMITTEE

Interregional Landscape Water Demand Reduction Program

Committee Members:
Shivaji Deshmukh, General Manager, Inland Empire Utilities Agency
Heather Dyer, General Manager, San Bernardino Valley Municipal Water District
Paul D. Jones, General Manager, Eastern Municipal Water District, Chair
Michael Markus, General Manager, Orange County Water District, Vice Chair
Craig Miller, General Manager, Western Municipal Water District

TUESDAY, FEBRUARY 9, 2021 – 8:30 A.M.

AGENDA

1. **CALL TO ORDER/PLEDGE OF ALLEGIANCE (Paul D. Jones, Chair)**

2. **PUBLIC COMMENTS**

   Members of the public may address the Committee on items within the jurisdiction of the Committee; however, no action may be taken on an item not appearing on the agenda unless the action is otherwise authorized by Government Code §54954.2(b).

PLEASE NOTE:
Americans with Disabilities Act: Meeting rooms are wheelchair accessible. If you require any special disability related accommodations to participate in this meeting, please contact (951) 354-4220 or kberry@sawpa.org. Notification at least 48 hours prior to the meeting will enable staff to make reasonable arrangements to ensure accessibility for this meeting. Requests should specify the nature of the disability and the type of accommodation requested.

Materials related to an item on this agenda submitted to the Commission after distribution of the agenda packet are available for public inspection during normal business hours at the SAWPA office, 11615 Sterling Avenue, Riverside, and available at www.sawpa.org, subject to staff's ability to post documents prior to the meeting.

Declaration of Posting

I, Kelly Berry, CMC, Clerk of the Board of the Santa Ana Watershed Project Authority declare that on Wednesday, February 3, 2021, a copy of this agenda has been uploaded to the SAWPA website at www.sawpa.org and posted at the SAWPA office, 11615 Sterling Avenue, Riverside, California.

2021 Project Agreement 22 Committee Regular Meetings

Interregional Landscape Water Demand Reduction Program
Second Tuesday of Every Month
(Note: All meetings begin at 8:30 a.m., unless otherwise noticed, and are held at SAWPA.)

January	**February**
1/12/21 ~~Regular Committee Meeting~~ [cancelled]	2/9/21 Regular Committee Meeting
March	**April**
3/9/21 Regular Committee Meeting	4/13/21 Regular Committee Meeting
May	**June**
5/11/21 Regular Committee Meeting	6/8/21 Regular Committee Meeting
July	**August**
7/13/21 Regular Committee Meeting	8/10/21 Regular Committee Meeting
September	**October**
9/14/21 Regular Committee Meeting	10/12/21 Regular Committee Meeting
November	**December**
11/9/21 Regular Committee Meeting	12/14/21 Regular Committee Meeting

Note: Per Action of the PA 22 Cmte on 1-23-20, (agenda item No. 4.E.), beginning March 2020 the regular PA 22 Committee meetings shall be held at 8:30 a.m. on the second Tuesday of every month.

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PROJECT AGREEMENT 22 COMMITTEE
Interregional Landscape Water Demand Reduction Program
REGULAR MEETING MINUTES
November 10, 2020

COMMITTEE MEMBERS PRESENT

Shivaji Deshmukh, General Manager, Inland Empire Utilities Agency
Heather Dyer, General Manager, San Bernardino Valley Municipal Water District
Paul D. Jones, General Manager, Eastern Municipal Water District [Chair]
Michael Markus, General Manager, Orange County Water District [Vice Chair]
Craig Miller, General Manager, Western Municipal Water District

COMMITTEE MEMBERS ABSENT

None.

STAFF PRESENT

Richard Haller, Karen Williams, Mark Norton, Ian Achimore, Marie Jauregui, Dean Unger, Jerry Oldenburg, Zyanya Ramirez

OTHERS PRESENT

Andrew D. Turner, Lagerlof, LLP

1. CALL TO ORDER

The regular meeting of the PA 22 Committee was called to order at 8:32 a.m. by Chair Paul Jones on behalf of the Santa Ana Watershed Project Authority, 11615 Sterling Avenue, Riverside, California. The record will reflect this meeting was conducted virtually.

Pursuant to the provisions of Executive Order N-25-30 issued by Governor Gavin Newsom on March 12, 2020, and Executive Order N-29-20 issued by Governor Gavin Newsom on March 17, 2020, any Committee member may call into the Committee meeting without otherwise complying with the Brown Act's teleconferencing requirements. In concert with state and local efforts to prevent the spread of COVID-19, and until further notice, the Santa Ana Watershed Project Authority will be holding all Board and Committee meetings by teleconference and virtually through the Zoom app. As set forth on the posted meeting agenda, this Committee meeting was accessible to the public by teleconference and through Zoom.

Members of the public who were unable to participate by teleconference or virtually were invited to submit comments and questions in writing via email for the Committee's consideration. All votes taken during this meeting were conducted via oral roll call.

2. PUBLIC COMMENTS

There were no public comments; there were no public comments received via email.

3. APPROVAL OF MEETING MINUTES: AUGUST 11, 2020

MOVED, approve the August 11, 2020 meeting minutes.

Result:	**Adopted by Roll Call Vote (Unanimously)**
Motion/Second:	Miller/Markus
Ayes	Deshmukh, Dyer, Jones, Markus, Miller
Nays:	None
Abstentions:	None
Absent:	None

4. COMMITTEE DISCUSSION ITEMS

A. WATER EFFICIENCY BUDGET ASSISTANCE REQUEST FOR PROPOSALS (PA22#2020.15)

Ian Achimore provided the PowerPoint presentation contained in the agenda packet on pages 16-36.

Under the Santa Ana River Conservation and Conjunctive Use Program's (SARCCUP) Water Use Efficiency Task, SAWPA manages the Smartscape Program and the Water Budget Assistance subtasks. Originally, the SARCCUP scope of work also included the Conservation-Based Water Rates subtask. Due to lack of interest for that subtask, it was replaced with a new subtask titled Water Budget Assistance. This subtask was submitted to the Department of Water Resources through the SARCCUP Amendment No. 2, which was approved on May 29, 2020. The originally-approved grant and cost share amounts remained the same.

Water Budget Assistance Subtask Budget		
Grant	Cost Share Total	Grant + Cost Share
$286,077	$937,381	$1,223,458

The Water Budget Assistance subtask will assist five-to-ten retail agencies to comply with State regulations that require them to adhere to agency-wide water budgets, prepare them to eventually study and adopt conservation-based water rates, and provide information to target other water use efficiency programs to inefficient water users.

SAWPA collaborated with the Water Conservation Advisory Group to develop a Request for Proposals for a consultant to implement the Water Efficiency Budget Assistance subtask. The Municipal Water District of Orange County (MWDOC) is also utilizing the RFP to hire a consultant to perform the same level of services. The proposed schedule for the RFP is as follows:

Milestone	Date
RFP Published	November 10, 2020
Responses Due	December 7, 2020
Consultant Interviews	Mid-December 2020
Recommendation to SAWPA's Governing Board	January 12, 2021
Recommendation to MWDOC's Governing Board	January 20, 2021*
Execute Contract with SAWPA	By January 22, 2021
Execute Contract with MWDOC	By January 29, 2021*

* Estimate

The term of the contract will be for a minimum of two years, beginning in January 2021. Organizations/Firms responding to the RFP are required to fill out a Fee Proposal Table (Appendix 3 of the RFP) where they can potentially give different costs depending on the amount of dedicated landscape meter customers, the amount of water agencies utilizing the

database, and whether customers have an existing meter location or not.

Joe Berg, Director of Water Use Efficiency at MWDOC, expressed his appreciation for SAWPA's collaborative efforts and how responses to the RFP will allow MWDOC to budget before State standards are in place. Vice Chair Markus noted the importance of informing agencies that are interested in the Water Efficiency Budget Assistance subtask of the possible cost shares. Ian Achimore noted that agencies are informed as they promote the subtask.

MOVED, approve the distribution of the Water Efficiency Budget Assistance Request for Proposals.

Result:	**Adopted by Roll Call Vote (Unanimously)**
Motion/Second:	Markus/Dyer
Ayes	Deshmukh, Dyer, Jones, Markus, Miller
Nays:	None
Abstentions:	None
Absent:	None

B. UPDATE ON THE ENHANCEMENTS TO WATERSHED-WIDE WATER BUDGET DECISION SUPPORT TOOL (PA22#2020.16)

Ian Achimore provided the PowerPoint presentation contained in the agenda packet on pages 77-86.

On July 14, 2020, the Committee approved funding allocation to acquire three-inch aerial imagery for the upper Santa Ana River Watershed as part of the Enhancements to Watershed-Wide Water Budget Decision Support Tool (Tool). The Tool is funded by the Department of Water Resources' (DWR) Proposition 1 grant, a cooperative funding agreement with the Bureau of Reclamation (Bureau), the SAWPA member agencies, and the Municipal Water District of Orange County (MWDOC).

Currently, DWR and their consultant Quantum Spatial are conducting a statewide data collection that will assist 400+ urban retailers across the State. DWR is using 12-inch, four band imagery captured in 2018. SAWPA and the Bureau will utilize imagery collected in 2020 for Orange County, and 2021 for the upper Santa Ana River Watershed. This 2020 and 2021 imagery will be higher resolution at three-inch, four band imagery.

SAWPA and the Bureau met with DWR and their consultant Quantum Spatial to ensure there was no duplication of the State's efforts and to learn from their image analysis process. Next steps in the development of the Tool are:

- Develop training datasets at one square mile girds from three-inch, four band imagery collected in 2015.
- Develop a QA/QC approach that may utilize random sampling methods in accordance with the professional standards (National Park Services and Imaging and Geospatial Information Society standards).
- Work with SAWPA member agencies and MWDOC to ensure the variability of landscape types being captured in their service areas.
- Imagery of Orange County will likely be available in January 2021.

This item was for informational and discussion purposes; no action was taken on Agenda Item No. 4.B.

C. EMERGENCY DROUGHT GRANT PROGRAM – RETENTION RELEASE (PA22#2020.17)

Ian Achimore provided the PowerPoint presentation contained in the agenda packet on pages 89-94.

The Committee is nearing completion of the implementation of the High Visibility Turf Removal and Retrofit Project (Project) under the Emergency Drought Grant Program (Program), which is being funded by Proposition 84 Integrated Regional Water Management (IRWM), the 2014 Drought Grant (Drought Grant) and local cost share from the SAWPA member agencies, Municipal Water District of Orange County (MWDOC), Rancho California Water District (RCWD) and Metropolitan Water District of Southern California (MWDSC).

SAWPA has submitted to DWR one of the two project completion reports required to finalize the Project. By finalizing that report, DWR will be able to release retention payments to the SAWPA member agencies and other partners approximately three months after DWR's approval of the retention payment.

Over the course of the Project schedule, from January 1, 2010 to the last invoice dated March 25, 2020, the Project completed turf removal by surpassing the amount included in the application by a combined 195% for both IRWM regions.

Grant application vs Actual Turf Removal				
IRWM Region	SF Amount from Application	SF Actual Amount	Percent of Application (%)	Actual AF Water Savings
SARW	4,000,000	8,074,885	202%	1,090
USMW	950,000	1,573,730	166%	212
Total	4,950,000	9,648,615	195%	1,302

The Committee members were very satisfied with the results and requested that an update be given to the SAWPA Commission and possibly the member agency governing boards.

This item was for informational and discussion purposes; no action was taken on Agenda Item No. 4.C.

5. FUTURE AGENDA ITEMS

- None.

6. ADJOURNMENT

There being no further business for review, the meeting ended at 9:26 a.m.

Approved at a Regular Meeting of the Project Agreement 22 Committee on Tuesday, February 9, 2020.

_____
Paul D. Jones, Chair

Attest :

_____
Kelly Berry, CMC
Clerk of the Board

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PA 22 COMMITTEE MEMORANDUM NO. 2021.1

DATE: February 9, 2021

TO: Project Agreement 22 Committee

SUBJECT: Water Efficiency Budget Assistance Project – Consultant Contract Approval

PREPARED BY: Ian Achimore, Senior Watershed Manager

RECOMMENDATION

Approve the recommended contract with Quantum Spatial for the Water Efficiency Budget Assistance Project for $594,387 and the retail water agency recruitment process that includes milestones with a formal schedule that interested agencies must meet in order to partner on the Project.

DISCUSSION

The Santa Ana River Conservation and Conjunctive Use Program (SARCCUP) includes a Water Use Efficiency Task, whereby SAWPA is the lead to implement its two sub-tasks: Smartscape and Water Efficiency Budget Assistance. As approved at the previous PA 22 Committee meetings, SAWPA released a Request for Proposals for a consultant to implement the Water Efficiency Budget Assistance sub-task. Through this sub-task, SAWPA will assist five to ten retail water agencies in the Santa Ana River Watershed by creating water use efficiency budgets for their dedicated irrigation meter customers. The purpose of this sub-task is that it:

- Uses $1.2 million in funding dedicated to the original SARCCUP conservation-based water rates sub-task funding that was replaced by the approval of the PA 22 Committee;
- Helps 5 to 10 retail agencies comply with State regulations that require water agencies to adhere to agency-wide water budgets (Senate Bill 606 and Assembly Bill 1668);
- Provides 5 to 10 retail agencies with budgets to prepare them to eventually study/adopt conservation-based water rates; and
- Provides 5 to 10 retail agencies with information to target other water use efficiency programs to inefficient water users.

By the RFP deadline in December 2020, three firms responded:

- Waterfluence LLC
- Quantum Spatial Inc. (Eagle Aerial sub-consultant)
- Geoenvironment LLC (Lynn Merrill & Associates sub-consultant)

All three firms were interviewed by six-person panel composed of the Municipal Water District of Orange County (MWDOC), Inland Empire Utilities Agency (IEUA), SAWPA, and Laguna Beach County Water District. The RFP criteria for considering proposals included the following:

- Responsiveness to the RFP,
- Experience and qualifications of the assigned team of individuals,

- Project approach and understanding of needs,
- Appropriateness of proposed fees, and
- Anticipated value and quality of services received.

Based on the interviews, the panel rate the firms as follows:

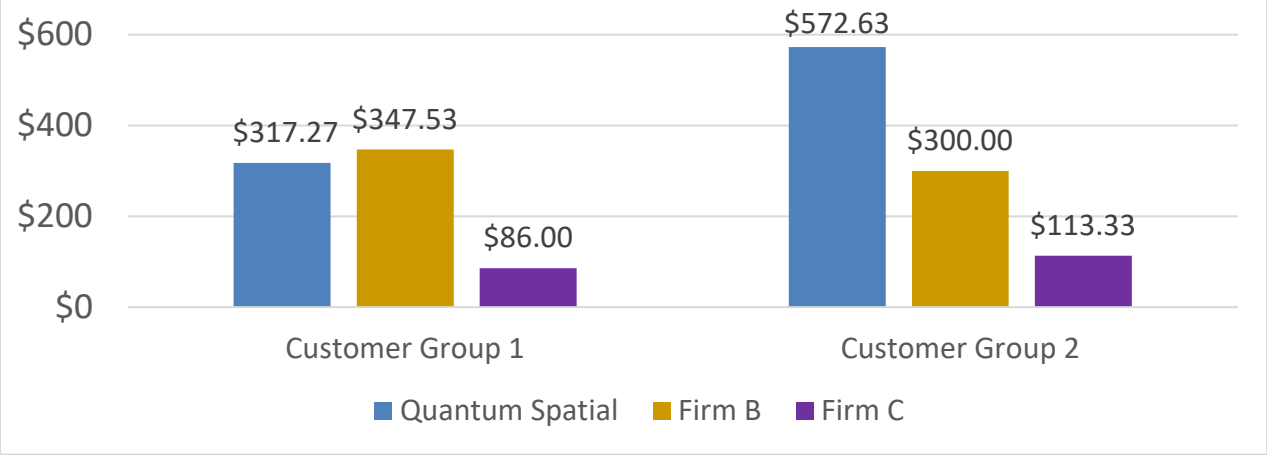
Table 1: Interview Panel Ratings

RFP Responder	Total for All Panelists	Panel Average
Quantum Spatial	152	25
Firm B	117	20
Firm C	105	18
Points Available	198	33

The total points available are 33 per panelist (198 total for all six panelists). Except for Quantum Spatial, the firm's identities are withheld for the purposes of sharing the ranking with the Committee. The prices (at a volumetric rate per dedicated landscape meter customer[1]) proposed by the three firms are shared in the figure below. The prices are broken into two overall customer group type:

- Group 1: Existing meter information generally available, customer knowledgeable of irrigated area.
- Group 2: No meter location available, may need field visit by consultant to determine irrigated area.

Figure 1: Prices Proposed by Firms



Quantum's prices were higher for Customer Group 2, but largely due to the firms experience and ability to scale up and down to implement the amount of customers, the panel scored them

[1] The RFP and scope of work with Quantum Spatial assume five meters per dedicated landscape meter customer.

very well and were unanimous in recommending the selection of Quantum Spatial for this contract.

As described in the RFP, the Quantum contract will be for a minimum of two years, beginning in February 2021. The contract includes SAWPA's standard general services agreement (GSA) and task order that SAWPA utilizes for its consultant contracts. The scope of work for the consultant was included in the in the RFP and is incorporated into SAWPA's standard task order. The total contract cost is $594,387 and is calculated using SAWPA staff's estimated customer amounts for Group 1 and 2 that it believes it can accomplish through this project with ten retail agency partners. The total contract value also factors in the costs for web-based databases that will be provided individually to the ten retail water agencies so they can view their water budget information without the need for GIS software on their desktop.

Table 2: Cost Calculations for Total Contract

	Price	Total Customers*	Customer Group 1*	Customer Group 2*
Guarantee Buy	$335,452.50	900	750	150
Additional Customers	$113,734.50	300	150	150
Web-based Database	$145,200.00	NA	NA	NA
Total Contract Value	**$594,387.00**	1,200	900	300

by incentivizing them to study, and hopefully, implement budget-based rates.

*Specific customer totals (in each column) not included in contract; customer group amounts just used for calculated contract.

Quantum did not propose changes to the SAWPA standard GSA and task order, but is requesting a guaranteed buy amount of at least $335,452.50 shown in the table above. They request this amount as, unlike a construction project with flat fees for each task, the billing is done volumetrically on a per customer basis. SAWPA will manage the project to ensure the most amount of customers are completed in the Project, and estimates it will meet the guarantee minimum buy amount which is calculated using the two volumetric prices from Group 1 and Group 2 by factoring in a total of 900 customers.

From retailers' meter count data in DWR's web-based data portal, retail water agencies in the Santa Ana River watershed on average have 140 "landscape irrigation" customers, but there are potentially more dedicated landscape meter customers in other customer categories like commercial, industrial and recycled water. SAWPA believes it can implement 1,200 total customers over the two-year schedule, so the Additional Customer line item was included in the cost calculation table above to represent an estimate of additional customers which could be included in excess of the guarantee buy amount of $335,452.50. Further sufficient funding, approximately $1 million, has been budgeted for the Water Efficiency Budget Assistance Project to accomplish all support work to meet the project goals and if demand for these services were to exceed customer count estimates.

CRITICAL SUCCESS FACTORS

- Administration of the OWOW process and plan in a highly efficient and cost-effective manner.
- Data and information needed for decision-making is available to all.

RESOURCE IMPACTS

The SARCCUP Water Budget Assistance sub-task is funded by Proposition 84 2015 Round IRWM grant funding and local cost share from the SAWPA member agencies. There is enough grant funding and local match for the Quantum Contract of $594,387 as well as funding for SAWPA project management costs.

Attachments

1. PowerPoint Presentation
2. General Services Agreement with Quantum Spatial
3. Task Order and Attachments with Quantum Spatial
4. Quantum Spatial Proposal

Water Efficiency Budget Assistance Project – Consultant Contract Approval

Mark Norton | Water Resources & Planning Manager

PA 22 Committee Meeting | Agenda Item 4.A.

February 9, 2021

Recommendation

- Approve the recommended contract with Quantum Spatial for the Water Efficiency Budget Assistance Project for $594,387 and the retail water agency recruitment process that includes milestones with a formal schedule that interested agencies have to meet in order to partner on the Project.

Purpose of Project (SARCCUP Scope of Work)

- Help **5 to 10** retail agencies comply with State regulations that require water agencies to adhere to agency-wide water budgets (Senate Bill 606 and Assembly Bill 1668);

- Other side benefits:
  A. Retailers can use Project data to understand customers and market conservation programs to them, and
  B. If interested in budget-based rates, retailers can use Project data to create budgets for rate charges.

Consultant to Complete Two Major Assignments

1

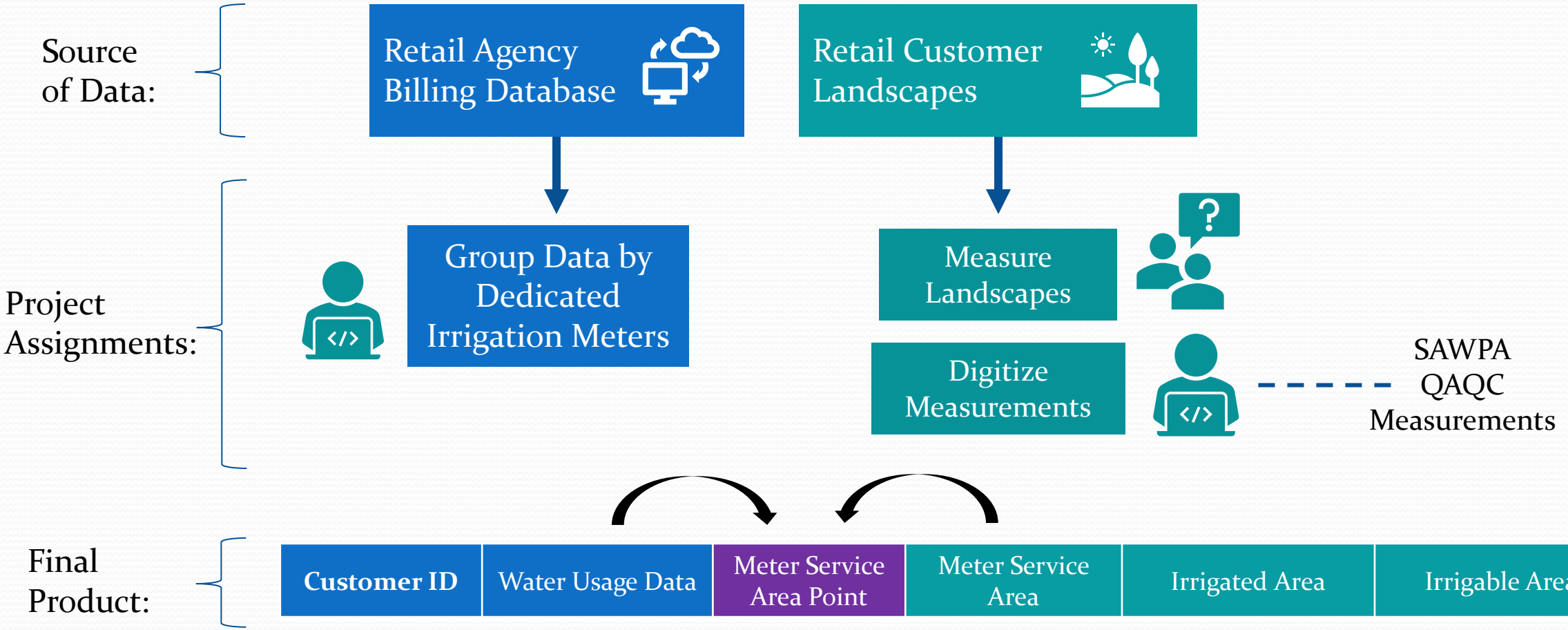
- Data mining retail water agency billing software queries to determine dedicated irrigation customers, their physical location in the service area if available, and their water usage,
- Develop a list of these customers,
- Using information from the Customer-Interface Work (next slide), create georeferenced digitized area measurements through GIS software based on the information gathered via the Customer-Interface Work,
- Upload data from the Project into a web-based application.

Consultant to Complete Two Major Assignments

- Interact with retail water agencies staff and their dedicated irrigation customers using the customer list from the GIS/Database Work (from previous slide),

- Calculate landscape measurements by working with water agency staff, customers, and/or property site managers.
    - Prioritize the use of remote sensing imagery; in field measurements to be used as last resort and special circumstances.

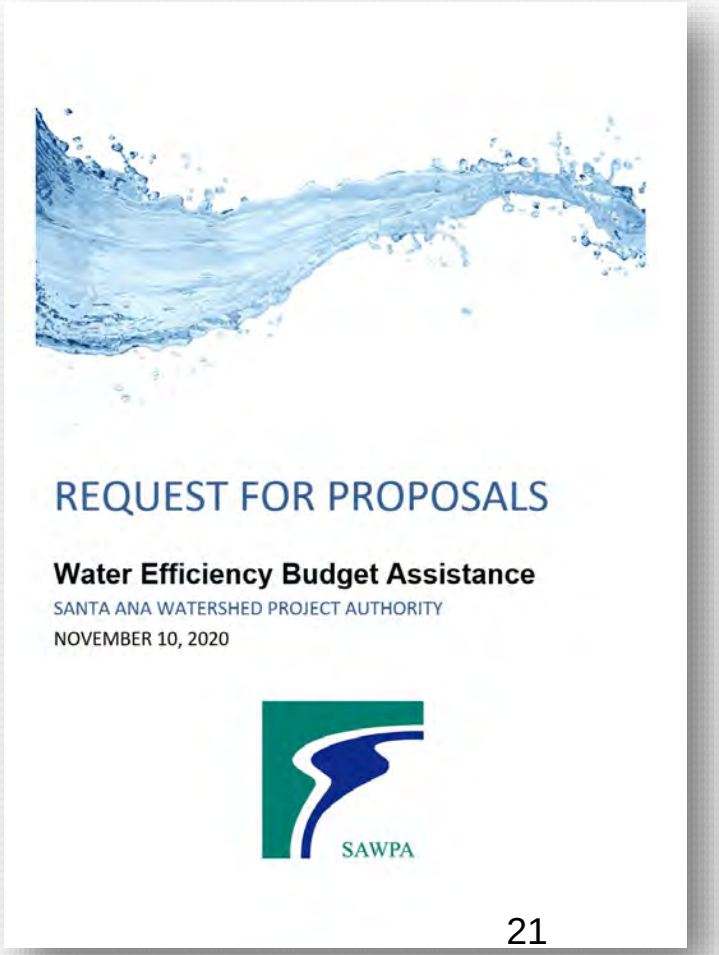
Relationship Between Assignments



Note: the two datasets are joined by meter service area point (not customer IDs)

Request for Proposals (RFP) Process

- **November 2020:** RFP approved by Committee and released,
- **December 2020:** Interviews with RFP responders (3 proposals),
- **January 2021:** Negotiating with "successful" consultant,
- **February 2021:** Recommended consultant contract to PA 22 Committee,
- **February/March 2021:** Begin formal recruiting of up to 10 retail water agencies.



RFPs Received

- Firms that responded to RFP:
  - Waterfluence LLC
  - Quantum Spatial Inc. (Eagle Aerial sub-consultant)
  - Geoenvironment LLC (Lynn Merrill & Associates sub-consultant)

- All firms were interviewed by six-person panel composed of MWDOC, IEUA, SAWPA, and Laguna Beach WD.

- RFP criteria for considering proposals:
  - Responsiveness to the RFP,
  - Experience and qualifications of the assigned team of individuals,
  - Project approach and understanding of needs,
  - Appropriateness of proposed fees, and
  - Anticipated value and quality of services received.

Pricing – Two Dedicated Landscape Meter Customer Groups

1. Existing meter information generally available, customer knowledgeable of irrigated area.
2. No meter location available, may need field visit by consultant to determine irrigated area.

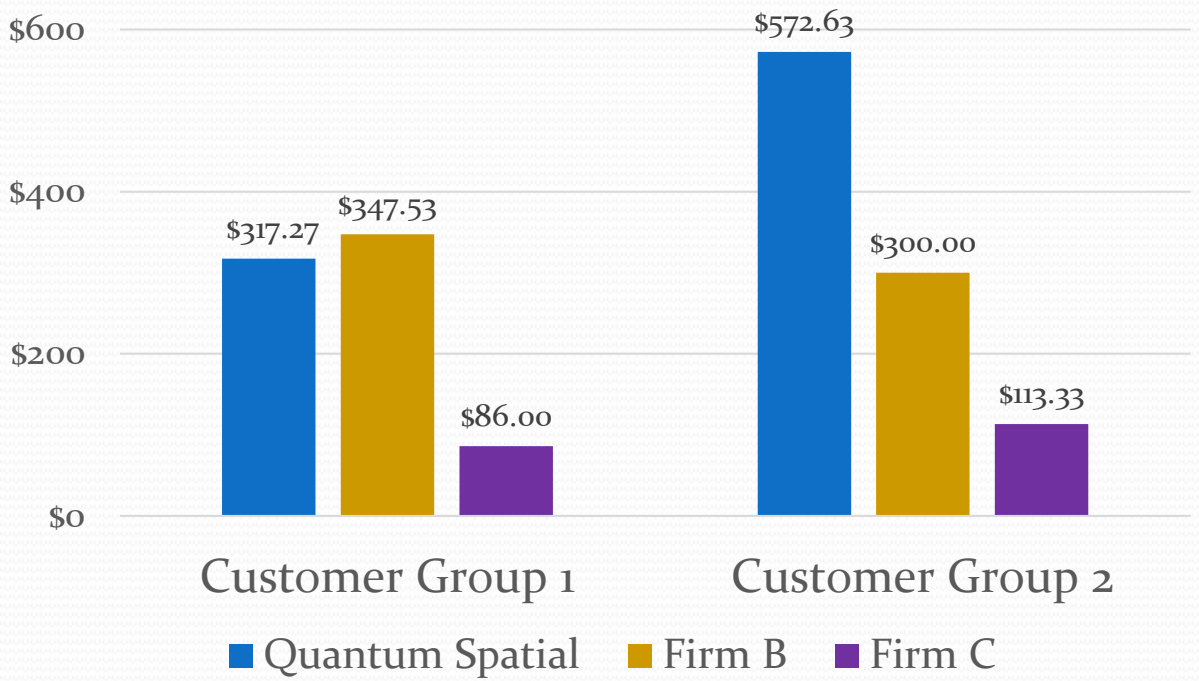
Analysis of RFPs Received

Interview Panel Results

RFP Responder	Total for All Panelists	Panel Average
Quantum Spatial	152	25
Firm B	117	20
Firm C	105	18
Points Available	198	33

Notes:
Total points available = 33 per panelist (198 total)
Total panelist = 6

Price Comparison (Per Customer)



About Quantum Spatial

- **Full-service geospatial and big data analytics** firm specializing in spatial data generation, integration, and analysis for clients worldwide.
- Quantum/Eagle was selected on a sole source basis by DWR to conduct the statewide residential **irrigated vegetation study of 14 million residential parcels in California**.
- A key component of this Project will be **Customer Outreach/Client Engagement**, which Quantum Spatial has extensive experience with, working with clients to gather their data, review project data, and solicit feedback.
- Sub-consultants for this Project include Eagle Aerial Solutions and WaterFluence.
- Other Quantum/Eagle clients include Santa Margarita Water District, California Water Service, Western Municipal Water District, and NOAA Office of Response and Restoration.

Quantum Pricing Table

	Price	Total Customers*	Customer Group 1*	Customer Group 2*
Guarantee Buy	$335,452.50	900	750	150
Additional Customers	$113,734.50	300	150	150
Web-based Database	$145,200.00	NA	NA	NA
Total Contract Value	**$594,387.00**	1,200	900	300

*Specific customer totals (in each column) not included in contract; customer group amounts just used for calculated contract.

Guarantee Buy – How it Works

- SAWPA will sign up 10 retail water agencies and do as many water budgets as possible in both customer groups,
- Agencies in watershed on average have 140 potable landscape irrigation customers based on DWR data*, but there are potentially more in other customer categories like commercial and industrial.
- 10 agencies *140 = 1,140 total customers
  - But assume some are more or less than the average, have data quality issues and customers who don't participate in project.
- If project completes exactly 750 customers in group 1 and 150 customers in group 2, it will precisely reach the guarantee buy amount.
  - But customers in each group don't have to be exact – SAWPA just needs to hit the dollar value of the guarantee buy.

*Data subject to errors as it's gathered from over 50 retail agencies.

Retail Water Agency Recruitment Process

- Two retail water agencies per SAWPA member agency (10 total),

- Goals for Onboarding Process:
  - Retailers that have long-term engaged staff on the project,
  - Not recommending cost share be required.

Recruitment Process Continued

- Milestones, questionnaire and kick-off meeting with assigned staff.

A. Letter of interest signed by GM and department head of assigned staff.
B. Kick off meeting with assigned staff.
C. Questionnaire form.
D. Require billing query of their most recent data to make sure they can provide data in a timely manner.

Recommendation

- Approve the recommended contract with Quantum Spatial for the Water Efficiency Budget Assistance Project for $594,387 and the retail water agency recruitment process that includes milestones with a formal schedule that interested agencies have to meet in order to partner on the Project.

SANTA ANA WATERSHED PROJECT AUTHORITY
GENERAL SERVICES AGREEMENT FOR SERVICES BY INDEPENDENT CONSULTANT

This Agreement is made this **9th day of February, 2021** by and between the Santa Ana Watershed Project Authority ("SAWPA") located at 11615 Sterling Avenue, Riverside, CA, 92503 and Quantum Spatial, Inc. ("Consultant") whose address is 1100 NE Circle Boulevard, Suite 126, Corvallis, OR 97330.

RECITALS

This Agreement is entered into on the basis of the following facts, understandings, and intentions of the parties to this Agreement:

- SAWPA desires to engage the professional services of Consultant to perform such professional consulting services as may be assigned, from time to time, by SAWPA in writing;
- Consultant agrees to provide such services pursuant to, and in accordance with, the terms and conditions of this Agreement and has represented and warrants to SAWPA that Consultant possesses the necessary skills, qualifications, personnel, and equipment to provide such services; and
- The services to be performed by Consultant shall be specifically described in one or more written Task Orders issued by SAWPA to Consultant pursuant to this Agreement.

AGREEMENT

Now, therefore, in consideration of the foregoing Recitals and mutual covenants contained herein, SAWPA and Consultant agree to the following:

ARTICLE I
TERM OF AGREEMENT

1.01 This agreement shall become effective on the date first above written and shall continue until **December 31, 2023**, unless extended or sooner terminated as provided for herein.

ARTICLE II
SERVICES TO BE PERFORMED

2.01 Consultant agrees to provide such professional consulting services as may be assigned, from time to time, in writing by the Commission and the General Manager of SAWPA. Each assignment shall be made in the form of a written Task Order. Each such Task Order shall include, but shall not be limited to, a description of the nature and scope of the services to be performed by Consultant, the amount of compensation to be paid, and the expected time of completion.

2.02 Consultant may at Consultant's sole cost and expense, employ such competent and qualified independent professional associates, subcontractors, and consultants as Consultant deems necessary to perform each assignment; provided that Consultant shall not subcontract any work to be performed without the prior written consent of SAWPA.

ARTICLE III
COMPENSATION

3.01 In consideration for the services to be performed by Consultant, SAWPA agrees to pay Consultant as provided for in each Task Order.

3.02 Each Task Order shall specify a total not-to-exceed sum of money and shall be based upon the regular hourly rates customarily charged by Consultant to its clients.

3.03 Consultant shall not be compensated for any services rendered nor reimbursed for any expenses incurred in excess of those authorized in any Task Order unless approved in advance by the Commission and General Manager of SAWPA, in writing.

3.04 Unless otherwise provided for in any Task Order issued pursuant to this Agreement, payment of compensation earned shall be made in monthly installments after receipt from Consultant of a timely, detailed, corrected, written invoice by SAWPA's Project Manager, describing, without limitation, the services performed, when such services were performed, the time spent performing such services, the hourly rate charged therefore, and the identity of individuals performing such services for the benefit of SAWPA. Such invoices shall also include a detailed itemization of expenses incurred. Upon approval by an authorized SAWPA employee, SAWPA will pay within 30 days after receipt of a valid invoice from Consultant.

ARTICLE IV
CONSULTANT OBLIGATIONS

4.01 Consultant agrees to perform all assigned services in accordance with the terms and conditions of this Agreement including those specified in each Task Order. In performing the services required by this Agreement and any related Task Order Consultant shall comply with all local, state and federal laws, rules and regulations. Consultant shall also obtain and pay for any permits required for the services it performs under this Agreement and any related Task Order.

4.02 Except as otherwise provided for in each Task Order, Consultant will supply all personnel and equipment required to perform the assigned services.

4.03 Consultant shall be solely responsible for the health and safety of its employees, agents and subcontractors in performing the services assigned by SAWPA.

4.04 Insurance Coverage: Consultant shall procure and maintain for the duration of this Agreement insurance against claims for injuries or death to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Consultant, its agents, representatives, employees or sub-contractors.

4.04(a) **Coverage -** Coverage shall be at least as broad as the following:

1. **Commercial General Liability (CGL) -** Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including products and completed operations, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars ($2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to SAWPA) or the general aggregate limit shall be twice the required occurrence limit.

2. **Automobile Liability –** (if necessary) Insurance Services Office (ISO) Business Auto Coverage (Form CA 00 01), covering Symbol 1 (any auto) or if Consultant has no owned autos, Symbol 8 (hired) and 9 (non-owned) with limit of one million dollars ($1,000,000) for bodily injury and property damage each accident.

3. **Workers' Compensation Insurance -** as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than $1,000,000 per accident for bodily injury or disease.

4. **Professional Liability** - (Also known as Errors & Omission) Insurance appropriates to the Consultant profession, with limits no less than $1,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

5. **Cyber Liability Insurance (Technology Professional Liability – Errors and Omissions) –** If Consultant will be providing technology services, limits not less than $2,000,000 per occurrence or claim, and $2,000,000 aggregate or the full per occurrence limits of the policies available, whichever is greater. Coverage shall be sufficiently broad to respond to the duties and obligations as is undertaken by Consultant in this Agreement and shall include, but not be limited to, claims involving infringement of intellectual property, including but not limited to infringement of copyright, trademark, trade dress,

invasion of privacy violations, information theft, damage to or destruction of electronic information, release of private information, alteration of electronic information, extortion and network security. The policy shall provide coverage for breach response costs as well as regulatory fines and penalties as well as credit monitoring expenses with limits sufficient to respond to these obligations.

If the Consultant maintains broader coverage and/or higher limits than the minimums shown above, SAWPA requires and shall be entitled to the broader coverage and/or higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to SAWPA.

4.04(b) If Claims Made Policies:

1. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.
2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.
3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Consultant must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

4.04(c) Waiver of Subrogation: The insurer(s) named above agree to waive all rights of subrogation against SAWPA, its elected or appointed officers, officials, agents, authorized volunteers and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the Agency; but this provision applies regardless of whether or not SAWPA has received a waiver of subrogation from the insurer.

4.04(d) **Other Required Provisions -** The general liability policy must contain, or be endorsed to contain, the following provisions:

1. **Additional Insured Status:** SAWPA, its directors, officers, employees, and authorized volunteers are to be given insured status (at least as broad as ISO Form CG 20 10 10 01), with respect to liability arising out of work or operations performed by or on behalf of the Consultant including materials, parts, or equipment furnished in connection with such work or operations.

2. **Primary Coverage:** For any claims related to this project, the Consultant's insurance coverage shall be primary at least as broad as ISO CG 20 01 04 13 as respects to SAWPA, its directors, officers, employees and authorized volunteers. Any insurance or self-insurance maintained by the Member Water Agency its directors, officers, employees and authorized volunteers shall be excess of the Consultant's insurance and shall not contribute with it.

4.04(e) **Notice of Cancellation:** Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to SAWPA.

4.04(f) Self-Insured Retentions - Self-insured retentions must be declared to and approved by SAWPA. SAWPA may require the Consultant to provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or SAWPA.

4.04(g) Acceptability of Insurers - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A: VII or as otherwise approved by SAWPA.

4.04(h) Verification of Coverage – Consultant shall furnish SAWPA with certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause. All certificates and endorsements are to be received and approved by SAWPA before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Consultant's obligation to provide them. SAWPA reserves the right to require complete, certified copies of all required insurance policies, including policy Declaration pages and Endorsement pages.

4.04(i) **Subcontractors -** Consultant shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Consultant shall ensure that SAWPA, its directors, officers, employees and authorized volunteers are additional insureds on Commercial General Liability Coverage.

4.05 Consultant hereby covenants and agrees that SAWPA, its officers, employees, and agents shall not be liable for any claims, liabilities, penalties, fines or any damage to property, whether real or personal, nor for any personal injury or death caused by, or resulting from, or claimed to have been caused by or resulting from, any negligence, recklessness, or willful misconduct of Consultant. To the extent permitted by law, Consultant shall hold harmless, defend at its own expense, and indemnify SAWPA, its directors, officers, employees, and authorized volunteers, against any and all liability, claims, losses, damages, or expenses, including reasonable attorney's fees and costs, arising from all acts or omissions of Consultant or its officers, agents, or employees in rendering services under this Agreement and any Task Order issued hereunder; excluding, however, such liability, claims, losses, damages or expenses arising from SAWPA's sole negligence or willful acts.

4.06 In the event that SAWPA requests that specific employees or agents of Consultant supervise or otherwise perform the services specified in each Task Order, Consultant shall ensure that such individual(s) shall be appointed and assigned the responsibility of performing the services.

4.07 In the event Consultant is required to prepare plans, drawings, specifications and/or estimates, the same shall be furnished with a registered professional engineer's number and shall conform to local, state and federal laws, rules and regulations. Consultant shall obtain all necessary permits and approvals in connection with this Agreement, any Task Order or Change Order. However, in the event SAWPA is required to obtain such an approval or permit from another governmental entity, Consultant shall provide all necessary supporting documents to be filed with such entity, and shall facilitate the acquisition of such approval or permit.

4.08 Consultant shall comply with all local, state and federal laws, rules and regulations including those regarding nondiscrimination and the payment of prevailing wages, if required by law.

ARTICLE V
SAWPA OBLIGATIONS

5.01 SAWPA shall:

5.01a Furnish all existing studies, reports and other available data pertinent to each Task Order that are in SAWPA's possession;

5.01b Designate a person to act as liaison between Consultant and the General Manager and Commission of SAWPA.

ARTICLE VI
ADDITIONAL SERVICES, CHANGES AND DELETIONS

6.01 During the term of this Agreement, the Commission of SAWPA may, from time to time and without affecting the validity of this Agreement or any Task Order issued pursuant thereto, order changes, deletions, and additional services by the issuance of written Change Orders authorized and approved by the Commission of SAWPA.

6.02 In the event Consultant performs additional or different services than those described in any Task Order or authorized Change Order without the prior written approval of the Commission of SAWPA, Consultant shall not be compensated for such services.

6.03 Consultant shall promptly advise SAWPA as soon as reasonably practicable upon gaining knowledge of a condition, event, or accumulation of events, which may affect the scope and/or cost of services to be provided pursuant to this Agreement. All proposed changes, modifications, deletions, and/or requests for additional services shall be reduced to writing for review and approval or rejection by the Commission of SAWPA.

6.04 In the event that SAWPA orders services deleted or reduced, compensation shall be deleted or reduced by a comparable amount as determined by SAWPA and Consultant shall only be compensated for services actually performed. In the event additional services are properly authorized, payment for the same shall be made as provided in Article III above.

ARTICLE VII
CONSTRUCTION PROJECTS: CONSULTANT CHANGE ORDERS

7.01 In the event SAWPA authorizes Consultant to perform construction management services for SAWPA, Consultant may determine, in the course of providing such services, that a Change Order should be issued to the construction contractor, or Consultant may receive a request for a Change Order from the construction contractor. Consultant shall, upon receipt of any requested Change Order or upon gaining knowledge of any condition, event, or accumulation of events, which may necessitate issuing a Change Order to the construction contractor, promptly consult with the liaison, General Manager and Commission of SAWPA. No Change Order shall be issued or executed without the prior approval of the Commission of SAWPA.

ARTICLE VIII
TERMINATION OF AGREEMENT

8.01 In the event the time specified for completion of an assigned task in a Task Order exceeds the term of this Agreement, the term of this Agreement shall be automatically extended for such additional time as is necessary to complete such Task Order and thereupon this Agreement shall automatically terminate without further notice.

8.02 Notwithstanding any other provision of this Agreement, SAWPA, at its sole option, may terminate this Agreement at any time by giving 10 day written notice to Consultant, whether or not a Task Order has been issued to Consultant.

8.03 In the event of termination, the payment of monies due Consultant for work performed prior to the effective date of such termination shall be paid after receipt of an invoice as provided in this Agreement.

ARTICLE IX
CONSULTANT STATUS

9.01 Consultant shall perform the services assigned by SAWPA in Consultant's own way as an independent contractor, in pursuit of Consultant's independent calling and not as an employee of SAWPA. Consultant shall be under the control of SAWPA only as to the result to be accomplished and the personnel assigned to perform services. However, Consultant shall regularly confer with SAWPA's liaison, General Manager, and Commission as provided for in this Agreement.

9.02 Consultant hereby specifically represents and warrants to SAWPA that the services to be rendered pursuant to this Agreement shall be performed in accordance with the standards customarily applicable to an experienced and competent professional consulting organization rendering the same or similar services. Furthermore, Consultant represents and warrants that the individual signing this Agreement on behalf of Consultant has the full authority to bind Consultant to this Agreement.

ARTICLE X
AUDIT AND OWNERSHIP OF DOCUMENTS

10.01 All draft and final reports, plans, drawings, specifications, data, notes, and all other documents of any kind or nature prepared or developed by Consultant in connection with the performance of services assigned to it by SAWPA are the sole property of SAWPA, and Consultant shall promptly deliver all such materials to SAWPA. Consultant may retain copies of the original documents, at its option and expense. Use of such documents by SAWPA for project(s) not the subject of this Agreement shall be at SAWPA's sole risk without legal liability or exposure to Consultant. SAWPA agrees to not release any software "code" without prior written approval from the Consultant.

10.02 Consultant shall retain and maintain, for a period not less than four years following termination of this Agreement, all time records, accounting records, and vouchers and all other records with respect to all matters concerning services performed, compensation paid and expenses reimbursed. At any time during normal business hours and as often as SAWPA may deem necessary, Consultant shall make available to SAWPA's agents for examination of all such records and will permit SAWPA's agents to audit, examine and reproduce such records.

ARTICLE XI
MISCELLANEOUS PROVISIONS

11.01 This Agreement supersedes any and all previous agreements, either oral or written, between the parties hereto with respect to the rendering of services by Consultant for SAWPA and contains all of the covenants and agreements between the parties with respect to the rendering of such services in any manner whatsoever. Any modification of this Agreement will be effective only if it is in writing signed by both parties.

11.02 Consultant shall not assign or otherwise transfer any rights or interest in this Agreement without the prior written consent of SAWPA. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this Agreement.

11.03 In the event Consultant is an individual person and dies prior to completion of this Agreement or any Task Order issued hereunder, any monies earned that may be due Consultant from SAWPA as of the date of death will be paid to Consultant's estate.

11.04 Time is of the essence in the performance of services required hereunder. Extensions of time within which to perform services may be granted by SAWPA if requested by Consultant and agreed to in writing by SAWPA. All such requests must be documented and substantiated and will only be granted as the result of unforeseeable and unavoidable delays not caused by the lack of foresight on the part of Consultant.

11.05 SAWPA expects that Consultant will devote its full energies, interest, abilities and productive time to the performance of its duties and obligations under this Agreement, and shall not engage in any other consulting activity that would interfere with the performance of Consultant's duties under this Agreement or create any conflicts of interest. If required by law, Consultant shall file a Conflict of Interest Statement with SAWPA.

11.06 Any dispute which may arise by and between SAWPA and the Consultant, including the Consultants, its employees, agents and subcontractors, shall be submitted to binding arbitration. Arbitration shall be conducted by a neutral, impartial arbitration service that the parties mutually agree upon, in accordance with its rules and procedures. The arbitrator must decide each and every dispute in accordance with the laws of the State of California, and all other applicable laws. Unless the parties stipulate to the contrary prior to the appointment of the arbitrator, all disputes shall first be submitted to non-binding mediation conducted by a neutral, impartial mediation service that the parties mutually agree upon, in accordance with its rules and procedures.

11.07 During the performance of the Agreement, Consultant and its subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status and denial of family care leave. Consultant and its subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Consultant and its subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code, Section 12290 et seq.) and the applicable regulations promulgated there under (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 et seq., set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full. Consultant and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. Consultant shall include the

non-discrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

11.08 Contractor's employees, agents and subcontractors shall adhere to, and comply with, the California Drug Free Workplace Act at Government Code, Sections 8350 through 8357.

In witness whereof, the parties hereby have made and executed this Agreement as of the day and year first above-written.

SANTA ANA WATERSHED PROJECT AUTHORITY

_____

Richard E. Haller, P.E., General Manager Date

QUANTUM SPATIAL, INC.

_____ _____

(Signature) Date Typed/Printed Name

SANTA ANA WATERSHED PROJECT AUTHORITY
TASK ORDER NO. QUAN504-01

CONSULTANT: Quantum Spatial, Inc. **VENDOR NO.:** 2284
1100 NE Circle Boulevard, Suite 126
Corvallis, OR 97330

COST: **$594,387.00**

PAYMENT: Upon Receipt of Proper Invoice

REQUESTED BY: Ian Achimore, Senior Watershed Planner February 9, 2021

FINANCE: _____
Karen Williams, Deputy GM/CFO Date

FINANCING SOURCE: Acct. Coding 504-402RATES-60500
Acct. Description SARCCUP – Program Expenses

COMMISSION AUTHORIZATION REQUIRED FOR THIS TASK ORDER: YES (X) NO ( )
Authorization: February 9, 2021; PA22#2021.1

This Task Order is issued upon approval and acceptance by the Santa Ana Watershed Project Authority (SAWPA) and Quantum Spatial, Inc. (Consultant) pursuant to the Agreement for Services between SAWPA and Consultant, entered into on February 9, 2021, expiring December 31, 2023.

I. PROJECT NAME OR DESCRIPTION
Water Efficiency Budget Assistance

II. SCOPE OF WORK / TASKS TO BE PERFORMED
Consultant shall provide all labor, materials, and equipment for the services to implement the scope of work attached as an exhibit to this Task Order.

Please also refer to Appendix X (attached) for acceptable formats.

III. PERFORMANCE TIME FRAME
Consultant shall begin work **February 10, 2021** and shall complete performance of such services by **February 28, 2023.**

IV. SAWPA LIAISON
Ian Achimore shall serve as liaison between SAWPA and Consultant.

V. COMPENSATION
For all services rendered by Consultant pursuant to this Task Order, Consultant shall receive a not-to-exceed sum of **$594,387.00**. SAWPA shall provide a guaranteed payment of at least **$335,542.50** for services completed by the Consultant over the performance time frame. The total amount of dedicated landscape meter customers (DLMC) completed under the Project shall be approximately 1,200 (assume 5 meters per DLMC). A portion of those DLMCs will fall in Customer Group 1 and Customer Group 2. For definitions of Group 1 and Group 2 see attachment to this Task Order.

Funding for the services, provided by the State through a reimbursable grant with SAWPA, will be provided to the Consultant when SAWPA is provided payment by the State after the calendar year's quarter. Each invoice from the Consultant shall be provided to SAWPA within 15 days after the end of the calendar year's quarter in which the services were performed. The Consultant's invoice will bill for dedicated landscape meter customers per the Fee Table below when the dedicated landscape meter customer's work is complete. The Consultant will bill separately for each retail agency database after each database is finalized. Those costs are also represented in the Fee Table below. Note that a retention withholding of 10% will be withheld on each quarterly invoice.

Table 1: Fee Table

	Price	Customers*	Customer Group 1*	Customer Group 2*
Guarantee Buy Customers	$335,452.50	900	750	150
Additional Customers	$113,734.50	300	150	150
Database**	$145,200.00	NA	NA	NA
Total Contract Value	**$594,387.00**	1,200	900	300

*Specific customer totals (in each column with *) not included here to specify the exact amount of customer's in the Project's scope of work; the customer group are included here for calculating contract total pricing.

**Databases will be billed based on a set retail water agency price ($10,560 per retailer included in Project) and a volumetric price of $33 per DLMC for each DLMC receiving services in the Project.

VI. CONTRACT DOCUMENTS PRECEDENCE

In the event of a conflict in terms between and among the contract documents herein, the document item highest in precedence shall control. The precedence shall be:

A. The Agreement for Services by Independent Consultant/Contractor.
B. The Task Order or Orders issued pursuant to the Agreement, in numerical order.
C. Exhibits attached to each Task Order, which may describe, among other things, the Scope of Work and compensation therefore.
D. Definitions of Group 1 and Group 2
E. Specifications incorporated by reference.
F. Drawings incorporated by reference.

In witness whereof, the parties have executed this Task Order on the date indicated below.

SANTA ANA WATERSHED PROJECT AUTHORITY

Richard E. Haller, P.E., General Manager Date

QUANTUM SPATIAL, INC.

(Signature) Date Print/Type Name and Title

SCOPE OF WORK SUMMARY

The Consultant shall complete the following overall scope of work:

GIS/Database Work:

- Data mining retail water agency billing software queries to determine dedicated irrigation customers, their physical location in the service area if available, and their water usage,
- Develop a list of these customers,
- Using information from the Customer-Interface Work (below), create georeferenced digitized area measurements through Geographic Information (GIS) software based on the information gathered via the Customer-Interface Work (below), and
- Upload data from the Project into a web-based application that retail agencies, SAWPA, the Municipal Water District of Orange County (MWDOC), and other select agencies such as the SAWPA member agencies can access.

Customer-Interface Work*:*

- Interact with retail water agencies staff and their dedicated irrigation customers using the customer list from the GIS/Database Work (above), and
- Calculate landscape measurements by working with water agency staff, customers, and/or property site managers.

SAWPA Provided Data/Information to Consultant

Note that SAWPA will provide the following material to help the consultant to complete the various tasks described in the detailed scope of work:

A. Retail Agency Selection:

Although the consultant will help with the onboarding of interested retail agencies (per Task 1 described in the Detailed Scope of Work), SAWPA will provide the list of retail water agencies that will ultimately receive the benefits under this Project. SAWPA will enter into an agreement with each of the retail water agencies separately from the contract with the consultant. SAWPA will provide the contact information for the lead retail water agency staff to the consultant. The lead staff person will likely be in the finance, information/technology system, public works, or water resources department of the retail water agency. Note that some retail water agencies use third-party consultants to manage their billing system databases and run queries of the system's data.

B. Existing (Modified) Parcel Boundary Data to Help Create Meter Service Areas:

SAWPA will provide modified parcel boundary polygons in a shapefile format known as "Meter Service Areas" because they were modified to estimate the area served by individual customer meters. These modified parcel boundaries were initially created parcel data from the four county[1] assessors. The parcel boundary lines were largely modified by moving the street facing parcel line from the existing boundary to the street-center line, thus capturing any potential parkways that the customer likely irrigates. The existing Meter Service Areas can be used as a starting point for the consultant as they will likely need further modification due to the complexity of dedicated landscape meters which often serve more than one parcel.

C. Existing Meter Service Area Points:

SAWPA has worked with 21 agencies (shown in **Appendix 2**) in the Santa Ana River Watershed to geolocate their Meter Service Areas through a single latitude and longitude point. This point is referred to as a **Meter Service Area Point** and is shown graphically in **Figure 4**. The purpose of a Meter Service Area Point is so customer billing data from the retailer can be linked to the three major data categories created through this Project:

1) Meter Service Areas,
2) Irrigable Areas, and
3) Irrigated Areas.

The Meter Service Area Point is not necessarily the coordinate for the physical meter.

Since the three new data fields above are all geolocation based, they can be created as GIS shapefiles, specifically as georeferenced polygons. In addition to being georeferenced polygons, these file types include attribute data that can be viewed/edited through GIS programs into tabular formats. Although the polygons cannot be rendered in a table format, the area measurement for each of the three new data fields can be.

Note that the last two categories of Irrigable and Irrigated Areas can be used to create a water budget to comply with the AB 1668 and SB 606. This outdoor water budget will likely be calculated using the following formula in **Figure 3** for each dedicated landscape meter customer included in the Project:

Figure 1: Water Budget Calculation

Irrigable (or Irrigated) Area x Reference* Evapotranspiration (ET) in Inches x ET Adjustment Factor x Conversion Factor from Inches to Gallons

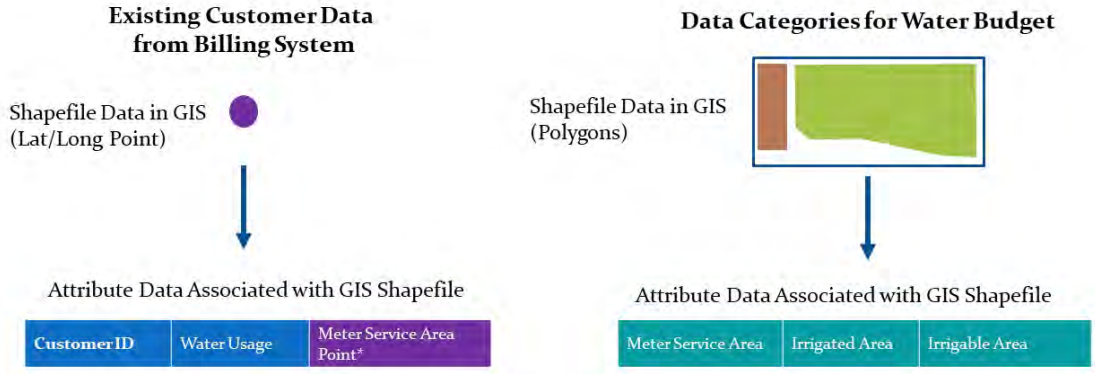
*Reference ET refers to ET for cool season turf grass that is consistently irrigated. The Department of Water Resources manages a database of weather stations across the State that collect ET data for cool season turf grass known as the California Irrigation Management Information System (CIMIS).

The linking between the customer data from the billing software, and these three new data categories is done through a GIS "spatial join." Shown below in **Figure 4** is a graphical representation of the relationship between the georeferenced data and its associated attribute

[1] Orange, Riverside and San Bernardino counties are within the Santa Ana River Watershed, as well as a small area of Los Angeles County.

data. Note that the figure below assumes the Meter Service Point already exists and is already tied to the customer account data (i.e. information like the customer ID and water usage).

Figure 2: GIS and Attribute Data



*The retailer may also have a "Meter Location" point instead of a Meter Service Area Point, which is described below.

More information on spatial join is provided through the following link:
https://pro.arcgis.com/en/pro-app/tool-reference/analysis/spatial-join.htm

Without the Meter Service Point associated with a customer, the spatial join is not possible and the billing data cannot be easily merged with the new data from this Project into a useful tabular product (i.e. the attribute data) where each customer include in the Project has an associated area measurement for their Meter Service Area, Irrigable Area and Irrigated Area.

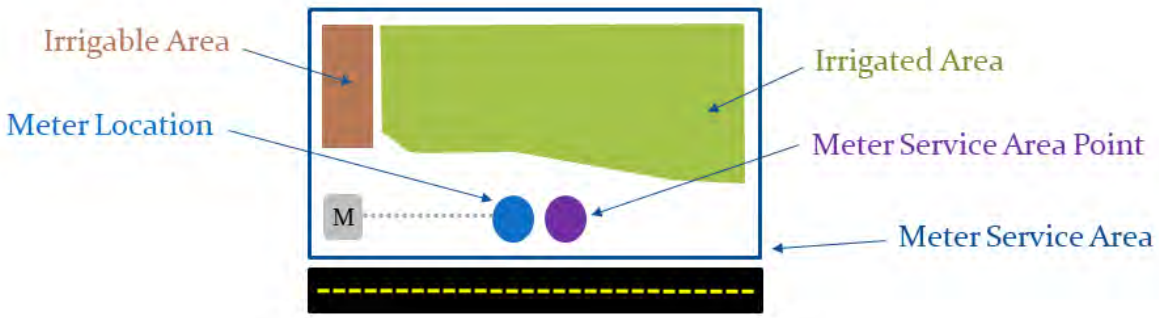
Note that some agencies selected for this Project may have meter location data outside of any work involving SAWPA. This **Meter Location** point, shown graphically in **Figure 5** will likely be one of two things:

1. A coordinate a water meter technician has identified in the field for the physical meter location[2], or
2. A coordinate created by a "smart" meter where the coordinates are transmitted to a database.

For other retailers, their billing systems may not necessarily have a Meter Location point or even an address of the parcel their meters are located within or nearby. Some will just have contact information (like a mailing address) for the meter/account which is used to distribute the customer bill. When there is no Meter Location or Meter Service Area Point **in** the Meter Service Area, the consultant will need to create one as described in the Detailed Scope of Work below.

[2] Some retail water agencies just have qualitative descriptions of where their physical meters are on a customer's property, and not necessarily coordinates.

Figure 3: Customer Data Categories



D. Imagery Options to Identify Irrigable and Irrigated Areas:

When there is a lack of customer or retailer knowledge of their meter(s) location and irrigation systems, it may be necessary for the consultant to physically measure **Irrigable** and **Irrigated** areas in the field. But this method should be a last resort to control the Project's costs.

There are several existing datasets the consultant can use to remotely map the Irrigable and Irrigated areas. These options for the consultant are shown below in **Table 1**.

Table 1: Imagery Options for Consultant

Area Captured	Source	Resolution	Dates Capture	Raw Imagery Available	Imagery Analysis Complete
Orange County (OC)	SCAG*/ SAWPA	3 inch; 4 band	Summer/Fall 2020	Winter 2020/21	Summer 2021
SAR Watershed not including OC	SAWPA	3 inch; 4 band	Summer 2021	Winter 2022/23	Summer 2022
Certain[3] Retail Water Agencies with SAR Watershed and OC	Department of Water Resources	12 inch, 4 band	2018	January 2021 on a rolling basis	January 2021 on a rolling basis
SAR Watershed	ESRI Inc.	Various	Various in 2019 and 2020	Through ArcGIS**	None
SAR Watershed	Google	Various	Various in 2019 and 2020	Through Google Earth Pro	None
SAR Watershed, no South OC[4]	SAWPA	3 inch; 4 band	Summer 2015	Readily Available	Complete

*SCAG is the Southern California Association of Governments.
**Consultant would need to access this data through their own ESRI account.

[3] Those retailers that use over 3,000 AF of water annually or serve more than 3,000 urban connections.
[4] South OC is defined as the area outside of the Santa Ana River Watershed.

For the SAWPA Summer 2015 imagery, there are several attributes associated with the imagery analysis:

a) Area measurements of the modified parcels (Meter Service Areas described above) as well as boundary lines,
b) Physical address (created largely using the "address matching"[5] approach),
c) Tree/shrub area measurement within the Meter Service Areas,
d) Turf area measurements within the Meter Service Areas, and
e) Dead-vegetation measurements within the Meter Service Areas.

[5] For a general definition of "address matching": https://www.caliper.com/glossary/what-is-address-matching.htm

DETAILED SCOPE OF WORK

The Consultant will perform the following scope of work.

Task 1 – Project Management

Prepare brief monthly progress reports and a final project completion report detailing the work completed to support retail water agencies. Consultant will provide a template to SAWPA outlining the monthly and final progress report, and consultant's invoicing prior to the first submitted report/invoice. Consultant will obtain approval from SAWPA on the monthly invoice, progress report design and contents.

Monthly progress reports will be the basis for monthly invoicing to SAWPA and will include a list of retail water agencies involved in the project. The report will include the following for each agency:

A. When they initiated their partnership with SAWPA on the Project,
B. Planned or actual date of execution of non-disclosure agreement,
C. Status of data deliveries (such as from billing records) from agency to consultant,
D. Number of customers and dedicated irrigation meters targeted for inclusion in Project,
E. Customer type (such as park, municipal property, HOA, etc.)
F. Number of customer budgets created to date and number of meters per customer, and
G. Cost per customer (using the Fee Attachment) and total cost per retail water agency.

The final project completion report will include:

A. Number of customers and dedicated irrigation meters with new budgets from the Project, including the table associated with Task 4 (shown in **Table 2**).
B. Any problems that occurred during the overall Project and how those problems were resolved.

The consultant will provide a mid-project update roughly into one year of Project implementation, and then a final project update (that includes the items in the final project report) once the Project is complete. These two consultant presentations will be provided to SAWPA's governing body.

Task 2 – Water Agency Onboarding

Assist with the onboarding of each retail water agency to partner with SAWPA through the following methods:

A. Answer technical questions throughout the term of the agreement from retail water agencies, SAWPA, MWDOC and the SAWPA member agencies regarding the Project,
B. Present the consultant's services regarding this Project at approximately three to five workshops to retail water agencies, SAWPA, MWDOC, SAWPA member agencies (approximately 2 hours each; SAWPA/MWDOC will assist with meeting coordination), and
C. Execute non-disclosure agreements with the retail water agencies[6] in order to ensure customer information such as unique billing identifiers, phone numbers, and water

[6] Five to ten retail water agencies in the SAWPA service area.

usage, is kept private (SAWPA to review these agreements prior to submitting to retail water agencies).

Task 3 – Database Analysis

Analyze retail water agency billing system queries, to be performed by water agency staff or their own consultants, to identify dedicated irrigation meter customers, customer type (such as parks or homeowner associations), their water usage and their likely location in the agency's service area. Document which dedicated irrigation meter customers have meter location data (latitude and longitude coordinates). Work with the retail water agency to narrow the list of dedicated irrigation meter customers[7] who will be the focus of this Project. Receive approval of that list by SAWPA before finalizing the list with the retail water agency. Create a customer contact list with specific locations for potential in-field visits (if necessary) at the water meter locations.

Task 4 –Measurement Analysis

Using the contact list described in Task 3, work with the retail water agency and the selected dedicated irrigation meter customers to schedule outreach to customers, including phone-based meetings, virtual conference calls, or as a fallback option, in-field meetings.

By working with the customers and their retail staff, calculate the area measurements and geolocated boundaries (which will become georeferenced polygons in GIS software) for the three following categories:

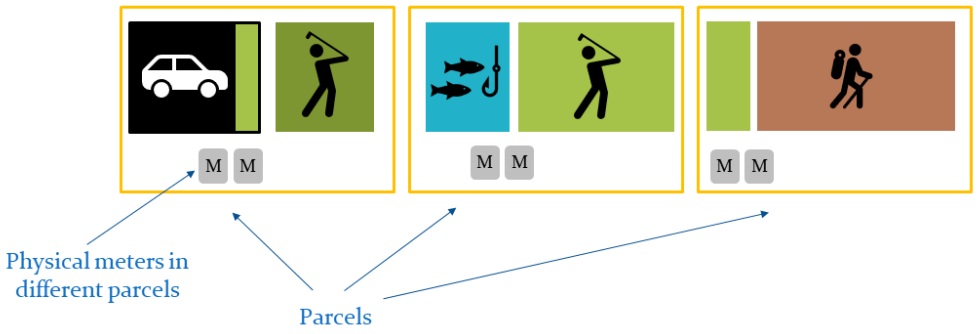
1. Meter Service Area[8],
    a. Meter Service Area Point (if needed)
    b. Meter Location (if preferred)
2. Irrigated Area, and
3. Irrigable Area.

Sub-Task 4a Meter Service Area and Meter Service Area Points

By working with the customers and their retail staff, the consultant will calculate the area measurements and geolocated boundaries for the Meter Service Area for the customers included in the Project. These Meter Service Areas will largely be modified parcel boundaries, as the dedicated irrigation meter customers that need assistance through this Project will often have multiple meters serving multiple parcels as shown in **Figure 6** below.

[7] SAWPA will likely be interested in prioritizing parks and other municipally maintained properties. This would be communicated to the retail water agencies during the onboarding process.
[8] Note that the Meter Service Area is not simply the sum of Irrigate and Irrigable Areas. It is further described in Sub-Task 4a.

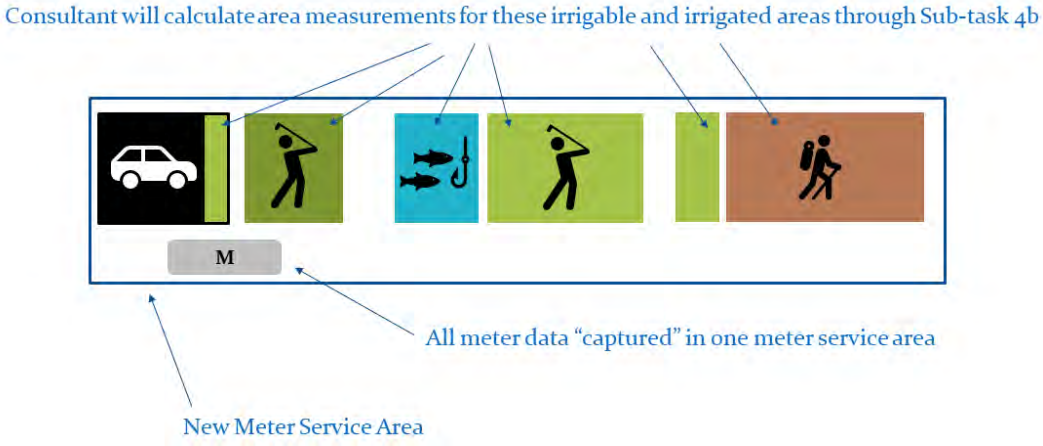
Figure 4: Dedicated Landscape Meter Before Project



Note: For the customer represented in **Figure 6** (and **Figure 7**), they have a "looped" system (meaning they have multiple meters connected to various locations on the retailer's distribution system). This makes it difficult to assign their meter usage to just one irrigated/irrigable area as their meters have the potential to serve all parcels, depending on timing of usage and pressure.

Through this sub-task, the consultant will work with the retail agency and customer to identify the contiguous or closely located parcels served by the customer's meters included in their billing account. Once located, they will merge the customer's parcels that encompass the entire areas that the customer potentially irrigates. The consultant will also make other boundary modifications to capture the customer's entire potentially irrigated area, for instance by extending the parcel boundary over any parkways or land strips not captured within the parcel. As shown in **Figure 6**, creation of the Meter Service Area is important when there are multiple meters that cover one or more parcels for the customer. In some cases, the physical meter can be outside the parcel that it irrigates.

Figure 5: Dedicated Landscape Meter After Project



Along with the Meter Service Area, the consultant will either complete the following:

A. Create through GIS software a Meter Service Area Point that is within the new Meter Service Area,
B. Create a Meter Location Point either through GIS software or in the field, or
C. Create neither if the retail water agency's Meter Location (or existing Meter Service Area Point) is within the Project's Meter Service Area and is available to the consultant.

The Meter Service Area Point and Meter Location Point are described in further detail in the "Scope of Work Summary" Section above and shown in **Figure 5**.

A Meter Service Point may be preferred by the retailer and customer due to the dual usage of using it to read their meters as well as completing a "spatial join" described in the "Scope of Work Summary."

Sub-Task 4b Irrigated and Irrigable Areas

Through this sub-task, the consultant will work with the retail agency and customer to digitize the Irrigated and Irrigable areas within the Meter Service Areas included in the Project. As discussed in the "Scope of Work Summary" Section above, SAWPA and other have existing aerial imagery datasets to remotely measure these areas through GIS software. It is preferred that the consultant "heads-up-digitize" the latest data by drawing georeferenced polygons that denote the estimated Irrigable and Irrigated areas for the customer. A first draft of the "heads-up-digitizing" effort will be provided to the customer before they are asked to confirm the Irrigated and Irrigable areas within their Meter Service Area.

If it is necessary due to the lack of customer or retail agency knowledge of their meter usage and likely watering areas, a field visit will be conducted where the consultant measures the Irrigated and Irrigable Areas. The consultant will measure the customer's landscapes using the attached area measurement techniques when appropriate in **Appendix 1**. Note that these measurement techniques are ideal for smaller areas, and not necessarily larger landscapes that many customers such as parks and HOAs have.

Note that the consultant should also account for the slope of customer's landscapes when they approximately average ≥ *2 vertical : 1 horizontal* for the customer landscape. Slope should be factored into the area measurement calculations for the customers the consultant is measuring remotely or in the field.

Specific Deliverables for Task 4

The consultant shall provide georeferenced polygons and coordinates (i.e. shapefiles) for the five categories listed below. In shapefile format, the consultant shall also provide attribute tables associated with the five categories listed below.

1. Meter Service Area,
    a. Meter Service Area Point (if needed)
    b. Meter Location (if preferred)
2. Irrigated Area, and
3. Irrigable Area.

The attribute tables for the retail agencies will be organized as shown in **Table 2**. The attribute tables are important because some retail agencies will not have in-house GIS software to view the shapefile data as polygons.

Table 2: Retail Agency Deliverable

Customer ID from Billing System	Other Data Associated with Customer such as Meter(s) Size	Customer Type (such as park)	Associated APN(s)	Meter Location or Meter Service Area Points (Lat/Long)	Meter Service Area (Area measurement)	Irrigated Area (Area Measurement)	Irrigable Area (Area Measurement)

And the SAWPA attribute tables will be organized as shown in **Table 3**. SAWPA will also be provided the polygon and coordinate data generated through this Project.

Table 3: SAWPA Deliverable

Unique Identifier[9]	Other Data Associated with Customer Such As Meter(s) Size[10]	Customer Type (such as park)	Associated APN(s)	Meter Location or Meter Service Area Points (Lat/Long)	Meter Service Area (Area measurement)	Irrigated Area (Area Measurement)	Irrigable Area (Area Measurement)

Task 5 – Quality Control

The consultant will provide a random sample of approximately three customer's landscape measurements (per retail agency) to SAWPA for quality control. These measurements will be provided digitally so that SAWPA can use remote sensing imagery to compare the measurements to imagery. SAWPA will review these samples and provide the consultant feedback, which may lead to changes in the final measurement calculations.

For purposes of verifying in-field landscape measurements, consultant will provide SAWPA and retail water agencies a schedule of when consultant will be working with customers. SAWPA or the retail water agency staff may elect to 'ride a long' to witness the field work performed by consultant.

Task 6 – Database for Calculating Water Budgets

The consultant will serve the imagery used and new polygons generated through this Project on a web-based application. The application will allow the user to see the attribute data collected for each polygon in the format shown in **Table 3**. The application shall have access control so only selected users can use it. It will allow the user to view the Meter Service Areas, Irrigable and Irrigated areas generated through this Project, as well as the Meter Service Area Points and any Meter Location points. The application shall overlay this new Project data onto a "basemap" of the color imagery. The color imagery used as the basemap will be specific to the retailer, as some may use the different ones listed in **Table 1**.

The application will also provide water efficiency budget calculations for the customers included in this Project. The water budget calculation will be done by using the formula in **Figure 3** and updated periodically with data from local CIMIS stations.

[9] Unique identifier does not need to be the retail water agency's own customer identifier from their billing database. It can be unique to the Project.

[10] SAWPA does not necessarily need water usage data if the retail water agency does not want to provide it.

Appendix 1: Area Measurement Techniques

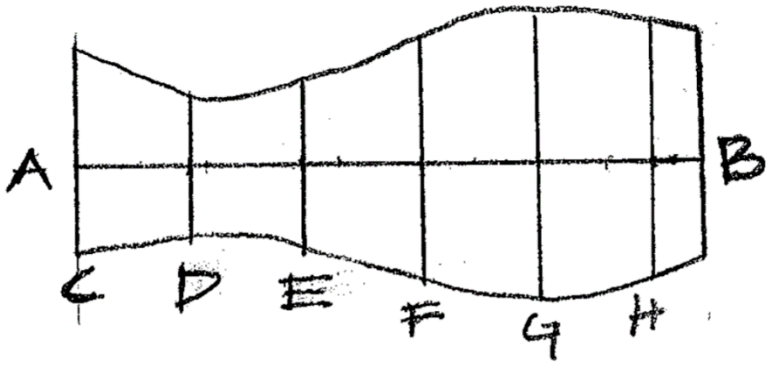
In-Field Measurement Technique

When measuring sites in the field, tape measurers remain the most accurate method of measurement. Measuring wheels are nearly as accurate when rolling on a flat surface such as concrete or asphalt. Measuring wheels on turf or shrub areas run the risk of being inaccurate. Tape measurers are recommended whenever uneven surfaces are encountered. For large sites, a map should be provided indicating all the irrigated and irrigable areas should be measured and noted with square footage. Note that most customer sites included in this Project will be larger, so tape measure and wheels may not be used as often, but slopes should be taken into account.

Odd shapes are often hard to measure accurately. A series of methods of measuring odd shapes have been reviewed and below are a listing of acceptable measurement techniques of odd shapes. Alternative measuring techniques must be submitted to SAWPA for review and approval prior to implementation and must be at least as accurate as the techniques listed here.

Non-Uniform Rectangle

First measure the length of the longest axis of the area (line AB). This is called the length line. Next, divide the length line into equal sections, for example 13 ft. At each of these points, measure the distance across the area in a line perpendicular to the length line at each point (lines C through H). These lines are called offset lines. Finally, average the lengths of all offset lines and multiply the result times line AB (65 ft. in this example). This is most notably different from the Non-Uniform Ellipse method in that exactly one of the left or right edges is measured, in this case line “C.”



Example: Non-Uniform Rectangular

Length line (AB) = 65 ft
Distance between offset lines is 13 ft apart

Length of each offset line:

C = 20 ft	F = 20 ft
D = 10 ft	G = 25 ft
E = 15 ft	H = 20 ft

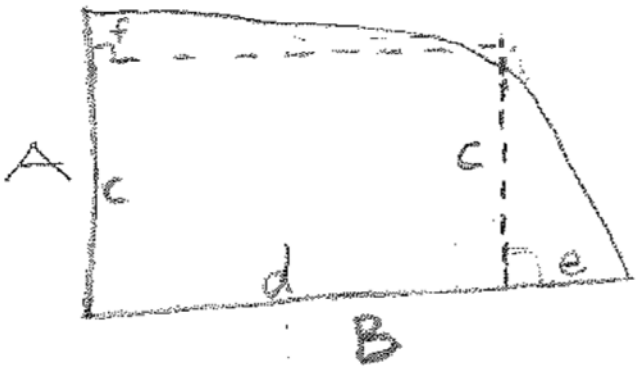
$$\text{Average length of offset lines} = \frac{(C + D + E + F + G + H)}{(\text{Number of offset lines})}$$

$$= (20 + 10 + 15 + 20 + 25 + 20) / 6$$
$$= 18.3 \text{ ft}$$

Total Area = (Length line)
x (Average length of offset lines)
= 65 ft x 18.3 ft
= 1189.5 ft^2

Irregular Rhombus or Widening Rectangular

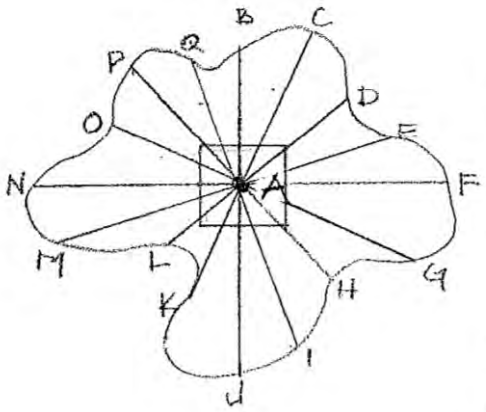
A fast way to measure irregular rhombi is shown in the example below. Stake one end of the measuring tape at point (A, B); measure line d and then line B. Without removing the stake measure line c and then line A. Using those four measurements you will be able to find line f and line e. The areas of triangle (fd), triangle (ce), and rectangle (cd) can now be calculated.

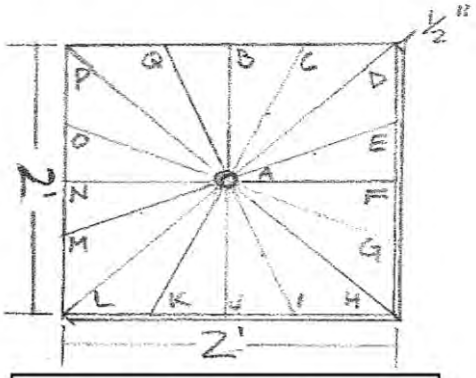


Example: Irregular Rhombus or Widening Rectangular
Length of each line: A = 20 ft c = 18 ft B = 25 ft d = 21 ft Line (f) = A – c Line (e) = B – d = 20 ft – 18 ft = 25 ft – 21 ft = 2 ft = 4 ft Area (cd) = c x d = 18 ft x 21 ft = 378 ft^2 Area (ce) = (c x e) / 2 = (18 ft x 4 ft) / 2 = 36 ft^2 Area (fd) = (f x d) / 2 = (2 ft x 21 ft) / 2 = 21 ft^2 Total Area = Area (cd) + Area (ce) + Area (fd) = 378 ft^2+ 36 ft^2 + 21 ft^2 = 435 ft^2

Non-Uniform Round

First measure 16 evenly spaced radii from the same center point (point A). This is called the center point. Next take the average of all the radii (B + C + D + E + F + G + H + I + J + K + L + M + N + O + P + Q) / 16. Use the average radii to calculate the area of a circle. (12.25 ft. in this example).





Board used for measuring

Example: Non-Uniform Round

Length of each offset line:
B = 10 ft E = 12 ft H = 10 ft K = 9 ft N = 16 ft Q = 9 ft C = 15 ft F= 15 ft
I = 15 ft L = 8 ft O = 10 ft D = 10 ft G = 13 ft J = 17 ft M = 15 ft P = 12 ft

Number of radii = 16

Average length of offset lines
= (B + C + D + E + F + G + H + I + J + K + L + M + N + O+ P + Q)
/ (Number of radii)

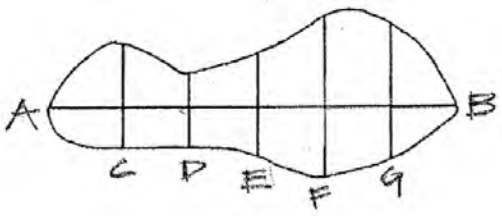
= (10 + 15 + 10 + 12 + 15 + 13+ 10 + 15 + 17 + 9 + 8 + 15 + 16 + 10 + 12 + 9)
/ 16

= 12.25 ft

Total Area = π x 12.25^2 ft
= 3.14 x 12.25 ft x 12.25 ft
= 471 ft^2

Non-Uniform Ellipses

The method used for irregular shaped areas is called the "offset method". First measure the length of the longest axis of the area (line AB). This is called the length line. Next, divide the length line into equal sections, for example 10 ft. At each of these points, measure the distance across the area in a line perpendicular to the length line at each point (lines C through G). These lines are called offset lines. Finally, add the lengths of all offset lines and multiply the result times the distance that separates these lines (10 ft. in this example). This is most notably different from Non-Uniform Rectangular in that neither the left or right edges of the shape are measured in the ellipse.



Example: Non-Uniform Ellipse

Length line (AB) = 60 ft
Distance between offset lines is 10 ft apart

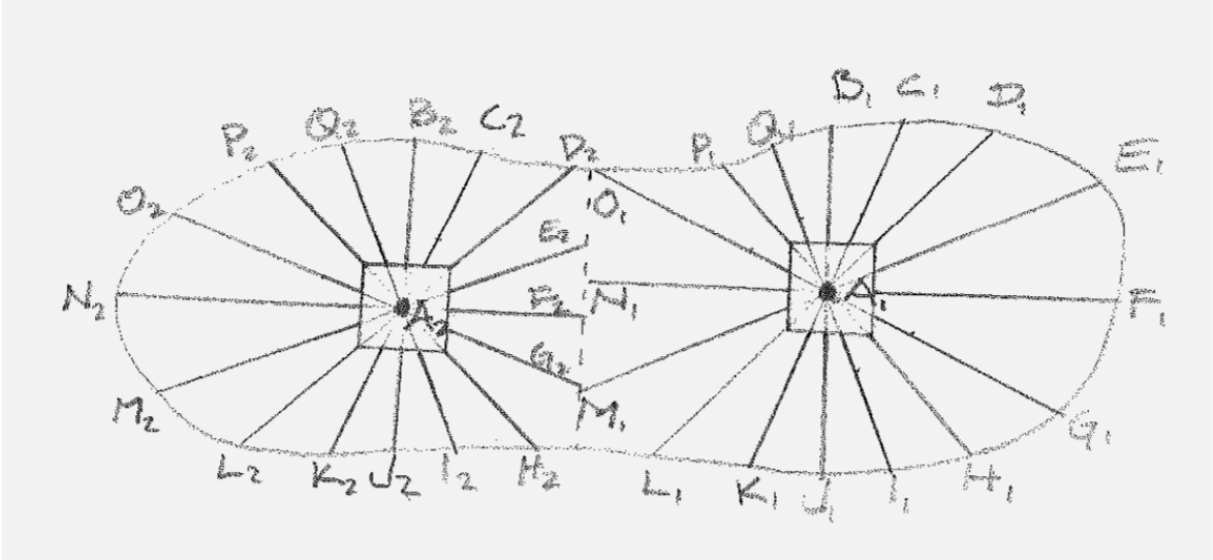
Length of each offset line
C = 15 ft F = 25 ft
D = 10 ft G = 20 ft
E = 15 ft

Total length
of offset lines = C + D + E + F + G
= 15 + 10 + 15 + 25 + 20
= 85 ft

Total Area = (Distance between offset lines)
x (sum of the length of offset lines)
= 10 ft x 85 ft
= 850 ft^2

Non-Uniform Ellipses Alternate

An alternate method of measuring non-uniform ellipses is by dividing the ellipses in uniform parts and utilizing the non-uniform round method as described above. An example is shown below.



Appendix 2: Agencies with Known Geolocation Data

SAWPA knows of 21 retail water agencies (listed below) who have geolocated Meter Service Area Points for some or all of their water meters. These Meter Service Area Points are within the "Existing Modified Parcel Boundaries" described in the Scope of Work Summary section. When SAWPA recruits agencies to participate in the Project, it will not prioritize just these agencies. This table is included as background on the historical effort involving creation of Meter Service Area Points by SAWPA in the Santa Ana River Watershed.

Anaheim City	Jurupa Community Services District
Chino City	Mesa WD
Chino Hills City	Monte Vista WD
City of Hemet	Norco City
City of Riverside	Ontario City
Corona City	San Bernardino City
Cucamonga Valley Water District (WD)	Upland City WD
East Valley WD	West Valley WD
Eastern Municipal WD	Western MWD
Fontana Water Company	Yorba Linda WD
Irvine Ranch WD	

Group Definitions Exhibit

Group 1 Includes:	1a	1c	1d
Meter Location Point*	Consultant Creates* Remotely Working with Retailer/Customer	Not Created	Not Created
Meter Service Area Point	Not Created	Consultant Creates Remotely Working with Retailer/Customer	Already Exists
Meter Service Area	Consultant Creates Remotely Working with Retailer/Customer	Consultant Creates Remotely Working with Retailer/Customer	Already Exists
Irrigated and Irrigable Area Measurements	Consultant Creates Through Heads-Up-Digitizing Imagery	Consultant Creates Through Analyzing Static Map from Retailer/Customer**	Consultant Creates Remotely Through Analyzing Imagery or Static Map
Slope Calculation for Area Measurements	Consultant Calculates Remotely	Consultant Calculates Remotely	Consultant Calculates Remotely

*Assume 5 meters serve each DLMC, consultant will create 5 georeference points for each of the 5 meter locations

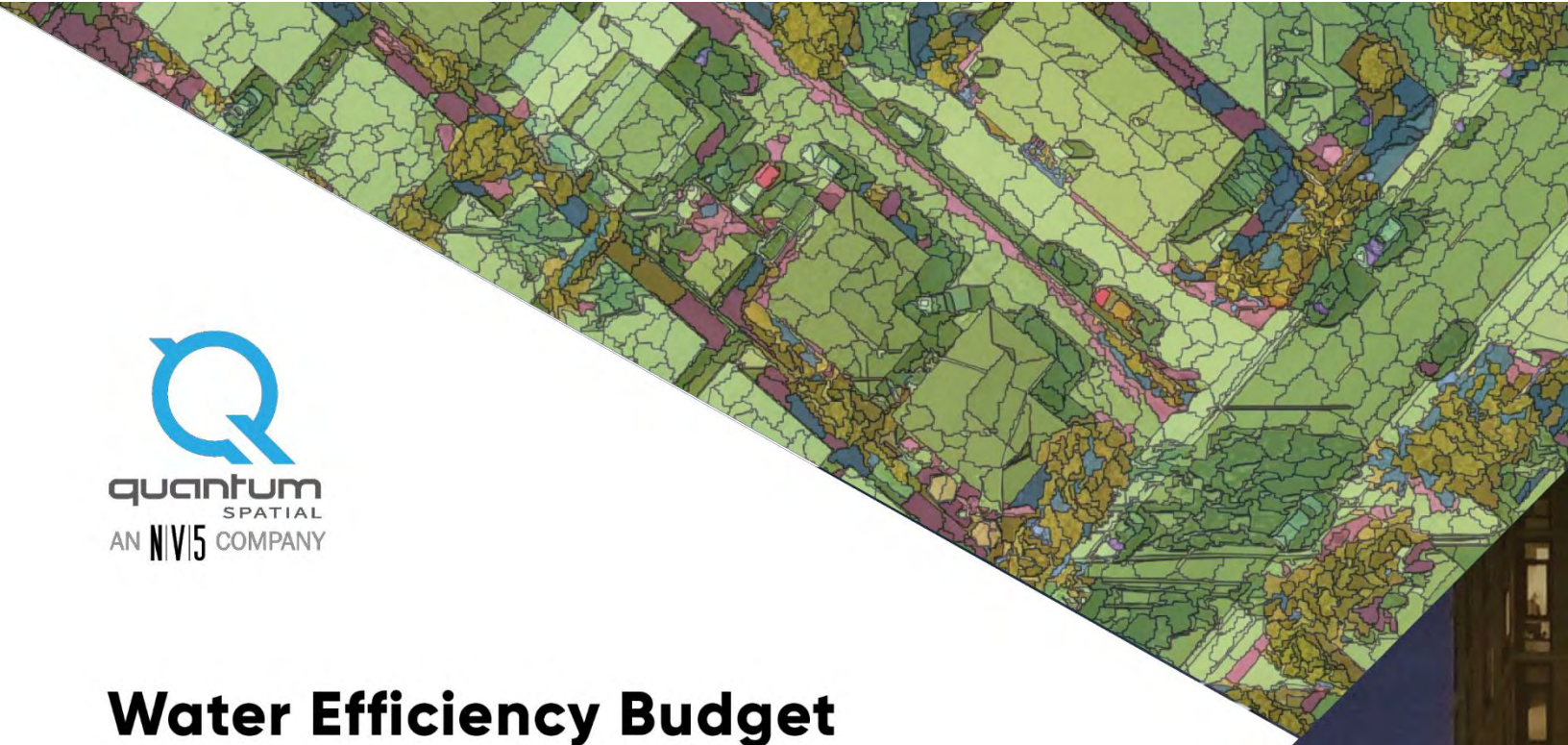
Group 2 includes:	1b	2b	2d
Meter Location Point*	Consultant Creates* Through Field Visit	Not Created (Already Exists)	Not Created
Meter Service Area Point	Not Created	Not Needed	Already Exists
Meter Service Area	Consultant Creates Through Field Visit	Consultant Creates Through Field Visit	Already Exists
Irrigated and Irrigable Area Measurements	Consultant Creates Through Field Visit	Consultant Creates Through Field Visit	Consultant Calculates Through Field Visit
Slope Calculation for Area Measurements	Consultant Creates Through Field Visit	Consultant Creates Through Field Visit	Consultant Calculates Through Field Visit

*Assume 5 meters serve each DLMC, consultant will create 5 georeference points for each of the 5 meter locations

Group Definitions Exhibit

Group 1 Includes:	2a	2c
Meter Location Point*	Not Created (Already Exists)	Not Created (Already Exists)
Meter Service Area Point	Not Needed	Not Needed
Meter Service Area	Consultant Creates Remotely	Consultant Creates Remotely Working with Retailer/Customer
Irrigated and Irrigable Area Measurements	Consultant Creates Through Heads-Up-Digitizing Imagery	Consultant Creates Through Analyzing Static Map from Retailer/Customer**
Slope Calculation for Area Measurements	Consultant Calculates Remotely	Consultant Calculates Remotely

*Assume 5 meters serve each DLMC, consultant will create 5 georeference points for each of the 5 meter locations



quantum SPATIAL
AN NV5 COMPANY

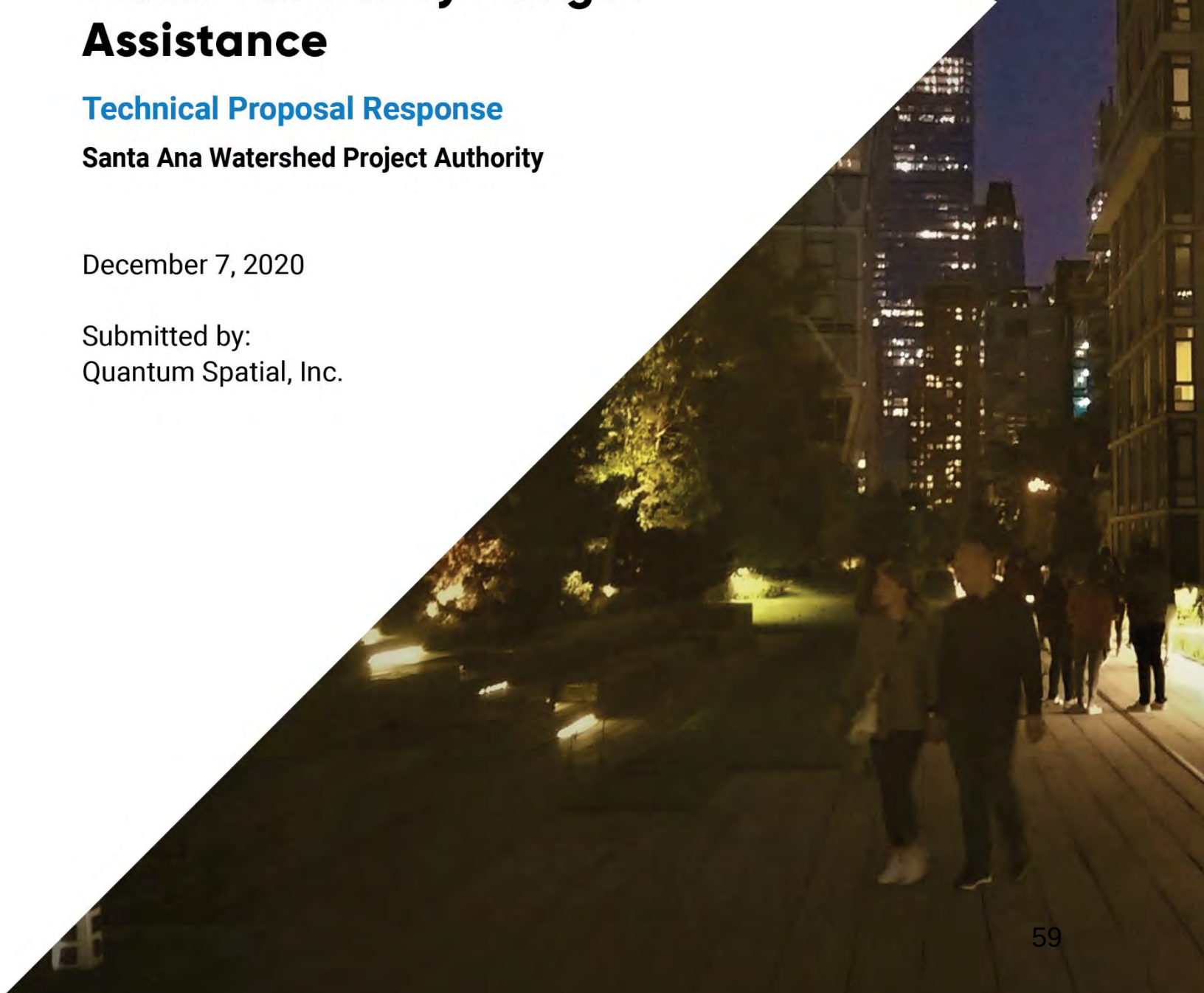
Water Efficiency Budget Assistance

Technical Proposal Response

Santa Ana Watershed Project Authority

December 7, 2020

Submitted by:
Quantum Spatial, Inc.



Contents

1.0 Executive Summary & Company Info

Quantum Spatial, Inc. (QSI), an NV5 Company, is pleased to present this Proposal Response to the Santa Ana Watershed Project Authority (SAWPA) in response to the solicitation issued on November 10, 2020, for the **Water Efficiency Budget Assistance Project.** This project will involve the creation of efficiency budgets for dedicated landscape meter customers in 5-10 retail water agencies of the SAWPA service area, and in up to 28 retail water agency partners in the Municipal Water District of Orange County (MWDOC).

QSI is the most innovative, nimble, and competitively positioned geospatial services, products, and analytics provider in North America. As Prime, we will work with Eagle Aerial Solutions (Eagle), based in Costa Mesa, CA, who with their operational WaterView™ Portal will support the field data collection app and the database management and water budget analysis task. John Whitcomb of Waterfluence, an expert in commercial irrigation water conservation, will advise the Team as a senior consultant providing expertise on commercial irrigation practices.

Our Team has a proud performance history working in partnership with California water management agencies since 2012, and is comprised of some of the most experienced, well-qualified, best equipped, and highly credentialed staff in the geospatial profession, with invaluable expertise in database management and administration, customer outreach, and client engagement. Our field team is based locally in Oceanside and Long Beach. In addition, we are highly familiar with the recent 2018 legislation driving the project needs (Assembly Bill 1668 and Senate Bill 606). Having worked closely with the CA Department of Water Resource (DWR), our Team fully understands the irrigated landscape classification scheme, required workflows, approach, and program management necessary to deliver high quality GIS and database services as well as the customer interface work to ensure the project is a success. We have designed our approach to not just meet the short term needs of SAWPA, but to build a scalable long term program for agencies in the SAWPA/MWDOC region.

Finally, QSI and Eagle have numerous established customer relationships with agencies within the SAWPA and MWDOC regions. We have developed considerable credibility throughout California in giving guidance to agencies based upon our knowledge of the mandated requirements of the conservation legislation as well as our experience with DWR and other leading agencies. This program will succeed if all parties are incentivized to succeed. Through our experience working with stakeholders in a GIS environment, we believe that our Team will help increase participation by both agencies and customers within the project area, supporting legislative compliance within the region.

Our submittal includes two documents -- a Technical Proposal (*This Document*) and a Fee Proposal ('Appendix 3' .xls file, named 'SAWPA_Pricing_Appendix_3_QSI_120720'). Our Technical Proposal includes all requested information (numbered as specified on page 14 of the RFP), including Background Information, Experience, Organizational Chart and Team Qualifications, Slope Calculation Methods, Methodology for Mapping & Measuring Irrigable/Irrigated Areas, Schedule and Project Approach, and an explanation of our Fee Proposal.

We think you will agree that the QSI Team is the most highly qualified choice to perform the Water Efficiency Budget Assistance Project. As Senior Program Director, I will serve as the **individual qualitied to enter into an agreement with SAWPA and MWDOC on behalf of the Quantum Spatial Team**. Please do not hesitate to contact me with any questions regarding our proposal.

Sincerely,

Andrew Brenner, Senior Program Director, Quantum Spatial, Inc.
Phone: (734) 680-6424; **Email**: abrenner@quantumspatial.com
Address: 1100 NE Circle Blvd., Suite 126, Corvallis, OR 97330

2.0 Background Information

2.1 Firm Profiles

Quantum Spatial, Inc. (QSI), an NV5 Company, is a full-service geospatial and big data analytics firm specializing in spatial data generation, integration, and analysis for clients worldwide. QSI brings over four decades of experience in providing quality geospatial solutions throughout North America. Our staff of over 500 employees includes a talented group of certified and licensed remote sensing specialists, PMI-certified Project Management Professionals, GIS specialists, data management analysts, professional engineers, licensed surveyors, image processing analysts, as well as foresters, hydrologists, and biologists, many with valuable experience in land cover/land use mapping and hydrologic analysis. Many of our staff have a background in natural resources and urban planning and have been on the forefront of using remotely sensed data for solving resource management problems. Through all phases of a project, from planning to final reporting and delivery of datasets, we adhere to techniques and practices that ensure our products meet or surpass industry standards and meet our client's needs. It is our strong-held philosophy to make sure our clients receive quality data with high utility, and we regularly recommend team collaborations and specific methodologies that ensure the delivery of such data.

Located in Costa Mesa, California, **Eagle Aerial Solutions (Eagle)** is a corporation formed in 1987, with 8 employees and a number of independent contractors. Eagle's high resolution, highly accurate orthoimagery has been purchased for multiple years by several county, municipal, and private entities. Eagle's expanding array of products and services also includes oblique imagery, elevation data and contours, building footprints, web-based GIS software solutions, wall murals, and remote sensing analysis services. Eagle clientele includes Orange County (OC), the OC Fire Authority, The Irvine Company, OC Water, OC Sanitation, OC Parks, the Transportation Corridor Agency, Irvine Ranch Water District and many cities, including Irvine, Anaheim, Newport Beach, Mission Viejo, Lake Forest, Laguna Hills, Aliso Viejo, Dana Point, Tustin, Santa Ana, Huntington Beach, Garden Grove, Yorba Linda, Buena Park, Brea, Orange, Lake Elsinore, and Corona. In partnership with QSI, Eagle has performed numerous irrigated vegetation analytic projects

for water agencies, including the statewide residential irrigated vegetation project conducted on behalf of DWR. Eagle has developed several web-based software solutions for water agencies, including the "Verification Portal" that has been developed for DWR to allow individual water agencies to confirm the of the accuracy of the statewide irrigation dataset. Eagle has also developed specialized web-based water conservation software programs called "WaterView™" and "WaterViewCII™". These tools are designed to help water agencies meet the efficiency and allocation requirements established under the new long-term California water conservation legislation (SB606 & AB1686).

Waterfluence, LLC is a small buisness that partners with water agencies to help their commercial and public customers with irrigation efficiency. Established in 2003 in the Bay Area of California, they now support 36 water agencies across the Western U.S. with service populations totaling over 7 million people. Commercial and public irrigation lands frequently have multiple stakeholders who are often associated with multiple sites in multiple communities. Blending technology with irrigation expertise, Waterfluence's award-winning website has specialized customer relationship management (CRM) capabilities to enable stakeholders to securely access and interact with their full portfolio of sites. Waterfluence's website assists thousands of water customers and stakeholders to 1) modify their maps online to improve water budget accuracy and to create controller maps to assist with irrigation operations, and 2) perform internal algorithms to continually analyze water use at each site to identify possible leaks, poor scheduling, and ineffective irrigation equipment. Waterfluence's irrigation experts conduct on-site landscape field surveys to generate detailed diagnostics.

2.2 Technical Qualifications

The Quantum Spatial Team has the qualifications and structure to both implement this Project and to establish it as the premier Program for water efficiency budgeting in the State. We understand the purpose of the Program, as well as the technology needed to build a system that will be cost-effective, customer-centric, and successful, reducing the burden on SAWPA and its partners in its implementation and maintenance.

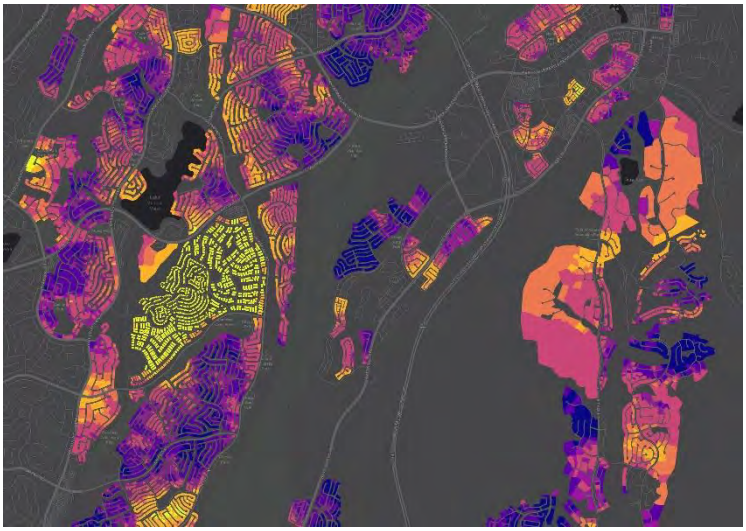
Based upon the accuracy of work we performed for DWR since 2012, in 2018 QSI/Eagle was selected on a sole source basis by DWR to conduct the statewide residential **irrigated vegetation study of 14 million residential parcels in California**. Our team worked for several years with DWR to develop the definitions and internal components that make up the irrigated vegetation categories required by DWR. We have completed most of that study and have achieved an independently confirmed accuracy in excess of the 95% accuracy spec required by DWR. They have approved our results and are beginning to deliver data to individual water districts. We have been told by DWR that they are strongly inclined to require the same classification methodology with CII analyses for the dataset to be acceptable to them. Our analytic protocols have proven to be successful at the statewide level and our approach has combined the best of machine learning and rigorous manual QC to produce the most cost effective results. One of the great strengths of our process is ***consistency*** throughout the dataset. We have the experience to ensure consistency whether the data is collected using automated analysis, heads up digitizing, map data transfer, or in the field. We will also ensure consistency with the DWR standards on which these data will be assessed. Given our vast experience in helping to develop the complex details of the DWR irrigated vegetation classification scheme as well as our proven success in this contract, the QSI Team is best qualified to perform the required CII irrigated vegetation analysis for SAWPA/MWDOC.

We bring additional benefits to the project with the following invaluable qualifications and offerings:

- Quantum Spatial **understands the underlying mission** of "Making Water Conservation a California Way of Life", as we have worked on irrigated landscape mapping with Water Districts in the State (many who are SAWPA clients) for 8 years, and directly on the statewide mapping of residential landscape area for 4 years.

- QSI is an expert in **geospatial mapping**, something that cannot be said of many other companies in this arena. Our geospatial expertise has value in both designing the most efficient and sustainable systems for capturing and managing spatial data, and in bringing remote sensing technologies into the analysis. Our goal is to provide scalable systems that will allow every customer within the project area to participate, if they desire.

Analysis of the influence of water conservation programs on non-participants (light = high impact, dark = low impact), Santa Margarita Irrigated Vegetation Analysis Project, 2017-Present.



- We are an expert in **Database Management and Administration** which are both essential to ensuring that the Program is easy to maintain and designed for maximum flexibility as the water conservation stewardship program evolves.

- A key component of this Program will be **Customer Outreach/Client Engagement**, which Quantum Spatial has extensive experience with, working with clients to gather their data, review project data, and solicit feedback. This process requires substantial time investment, trained staff, and detailed tracking systems, to ensure a robust process of customer review and sign-off.

- As a result of our work with the State, we **understand and provide perspective to SAWPA** on how the legislation will impact SAWPA clients, allowing the Districts to prepare for future impact of legislation. For our team member and partner Eagle Aerial, this is their core business and they bring both a field application for data collection and a **fully functional portal** (within their WaterView™ application) to calculate water budgets and compare those budgets against actual water use.

- Our Team has the **capacity** to scale this Program to all Water Districts in the SAWPA and MWDOC service areas; we have unparalleled capacity in both the mapping and outreach arenas; and we can take this Program to whatever size is desired by its sponsors.

3.0 Experience - Project References

Quantum Spatial (NV5), Eagle Aerial Solutions, and Waterfluence together bring the expertise needed to effectively create the datasets and systems to support this project. Below we provide the QSI Team's experience relevant to the SAWPA/MWDOC Water Efficiency Budget Assistance contract (Table 1). These seven (7) projects illustrate our Team's experience with similar services, and each specified a listing of Team personnel involved in each project. These reference projects demonstrate that we are mapping experts in both the automated and manual realm (all projects). We have expertise in mapping and working with outdoor irrigation (Projects 1, 2, 3, 4, 5), providing web-based data management (Projects 4, 7), providing water budgeting systems (Project 4), and implementing systems for working with individuals and organizations for data exchange and sign off (Projects 1, 2, 3, 4, 5, 7). In addition, we have local resources with extensive experience collecting field data (Projects 5, 6). These projects provide a small example of the vast experience of our Team. Any reference provided in Table 1 may be consulted for feedback and additional information regarding the quality and timeliness of our work.

Table 1. QSI Team Experience Related to SAWPA Water Efficiency Budget Assistance Project.

Project	Project Name *Client*	Reference POC	Start and End Dates	Services	Personnel Overlap
1	**Landscape Area Estimates** *California Department of Water Resources*	Bekele Temesgen P.O. Box 942836 Sacramento, CA 94236-0001 916-862-2266 Bekele.Temesgen@water.ca.gov	2018 - Present	Irrigated Landscape Modeling	Brenner, Marcella, Molloy, Wallace, Watkins, Wiggins
	Project Description: **QSI/Eagle** performed an irrigated landscape analysis of all 12 million single and multi-family residences in California. QSI has now mapped the majority of 400 Water Districts covering 16,000 square miles of urban land. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. Using state-of-the-art semi-automated approaches, all areas were classified into irrigated and irrigable status. Ancillary data such as parcel boundaries were used, and irrigation status was determined using deep learning methods. An accuracy assessment implemented on each district using an independent set of manually interpreted parcels indicated that the overall classification accuracy at the district level exceeded 95%.				
2	**Cal Water Irrigated Vegetation Mapping** *California Water Service*	Ken Jenkins 2632 West 237th St. Torrance, CA 90505 310-257-1484 kjenkins@calwater.com	2019 - Present	Irrigated Landscape Mapping, Change Detection	Brenner, Marcella, Molloy, Wallace, Watkins, Wiggins
	Project Description: In 2019, **Eagle/QSI** was tasked to map the irrigation status of all residential parcels within the Cal Water Service Area (497 sq. miles). Mapping is based on 1-ft aerial imagery collected in 2018 with changes identified and updated based on 3-inch imagery collected in 2019. Mapped irrigation status is used by Cal Water to set budget-based rates for water customers. Accuracy is > 95% at the parcel level.				
3	**Santa Margarita Irrigated Vegetation Analysis** *Santa Margarita Water District*	Nate Adams 26111 Antonio Pkwy Rancho Santa Margarita, CA 92688 949-459-6533 natea@smwd.com	2017 - Present	Irrigated Landscape Mapping & Analysis, Change Detection	Brenner, Marcella, Molloy, Watkins
	Project Description: **Eagle/QSI** provided an updated remote sensing analysis of the irrigation status of residential parcels within the Santa Margarita Water District. Subsequently, QSI conducted a change detection based on the land cover types mapped in 2014 and 2017. In this timeframe, the Santa Margarita Water District implemented a set of water-wise landscaping programs designed to promote outdoor water conservation. Using statistical measures of spatial correlation, observed land use changes were analyzed to determine if they were random or displayed a spatial pattern. These analyses were followed with an assessment of how non-program participants were influenced by program participants with respect to their landscaping.				

Table 1. QSI Team Experience Related to SAWPA Water Efficiency Budget Assistance Project – Continued.					
Project	**Project Name** ***Client***	**Reference POC**	**Start and End Dates**	**Services**	**Personnel Overlap**
4	**WaterView™** *Western Municipal Water District*	Rob Whipple 14205 Meridian Parkway Riverside, CA 92518 951-571-7259	2019 - ongoing	Data management Tool	Molloy
	Project Description: **Eagle Aerial** provided WaterView™ application support to aid the Western Municipal Water District in water conservation management goals. WaterView™ is a custom data management tool custom designed to help water professionals meet the efficiency and allocation requirements established under the new long term California water conservation legislation. WaterView™ allows water agencies to analyze total water allocation at the parcel level in compliance with new DWR standards, helps spot water use trends, tracks and manages over-allocation users within each district, and aids in upcoming DWR reporting requirements.				
5	**Commercial, Irrigation and Institutional Irrigation Assessments** *Bay Area Water Supply and Conservation Agency (BAWSCA)*	Kyle Ramey 155 Bovet Road, Suite 650 San Mateo, CA 94402 650-349-3000 kramey@bawsca.org	2003 - Present	Irrigated Landscape Mapping, Water Budget Analysis	Whitcomb
	Project Description: **Waterfluence** supported the optimization of outdoor irrigation for commercial entities. Participating agencies included Alameda County Water District, City of Brisbane, City of Hayward, City of Menlo Park, City of Millbrae, City of Redwood City, City of San Bruno, City of Foster City (Estero), and the Mid-Peninsula Water District.				
6	**Watershed Monitoring for Total Maximum Daily Loads (TMDLs)** *Lake Elsinore and San Jacinto Watersheds Authority (LESJWA)*	Rick Whetsel 11615 Sterling Ave. Riverside, CA 92503 951-354-4222 rwhetsel@sawpa.org	2015 - Present	Field work, automated sampling, CEDEN data management, and annual reporting	Hallack
	Project Description: Working with GIS software and field data collection devices, **QSI (NV5)** implemented the annual watershed-wide monitoring and reporting program for the Lake Elsinore and Canyon Lake Nutrient TMDL Task Force. Storm sampling events were conducted to determine the total nutrient loads into the lakes from their tributaries, and annual water quality data were used to calculate loads and evaluate nitrogen and phosphorus TMDL compliance with waste load allocations.				
7	**Environmental Sensitivity Index (ESI)** *NOAA Office of Response and Restoration*	Nicolle Rutherford 1305 East-West Highway Silver Spring, MD 20910 206-526-4913 Nicolle.R.Rutherford@noaa.gov	2016 - 2019	Shoreline Mapping, Field Work, Biological & Human Use Analysis, Custom Tool Development, White Paper	Brenner, Marcella

Project Description: QSI developed an outreach system for data gathering and communication/interaction with a wide range of stakeholders and data stewards to update the Environmental Sensitivity Index (ESI) and associated Atlas used to guide emergency environmental mitigation response to oil spill and other natural/manmade disasters. Through this outreach system, QSI performed shoreline mapping updates, field verification, and biological and human use analysis to update the ESI for the coasts of New York/New Jersey Metropolitan Area (last updated 2001), the Hudson River (2006), the south shore of Long Island (2009), and coastal North Carolina (2011). In addition, QSI developed the ESI Atlas Tool as a Python Add-In to the ESI toolbox, which allows users with minimal GIS skills to generate custom, publication-quality ESI maps. QSI also provided ancillary ESI product development services including converting biology data to updated formats and updated the biology and human-use sections of the official NOAA ESI Guidelines.

4.0 Organizational Chart & Team Qualifications

Our Team offers the experience, education, licensure and certifications to successfully accomplish the work outlined in the Water Efficiency Budget Assistance RFP. This section will illustrate our proposed management staff and lead personnel who will be responsible for the SAWPA/MWDOC contract. Section 4.2 provides a summary of the qualifications of all key staff. Full resumes are provided in Appendix A.

4.1 Management and Project Team Org Chart

Figure 1 illustrates the personnel structure of the QSI Team, including roles and lines of communication / authority. Each lead will be supported by a group of 10+ qualified data management analysts, mapping technicians, outreach staff, and field support staff.

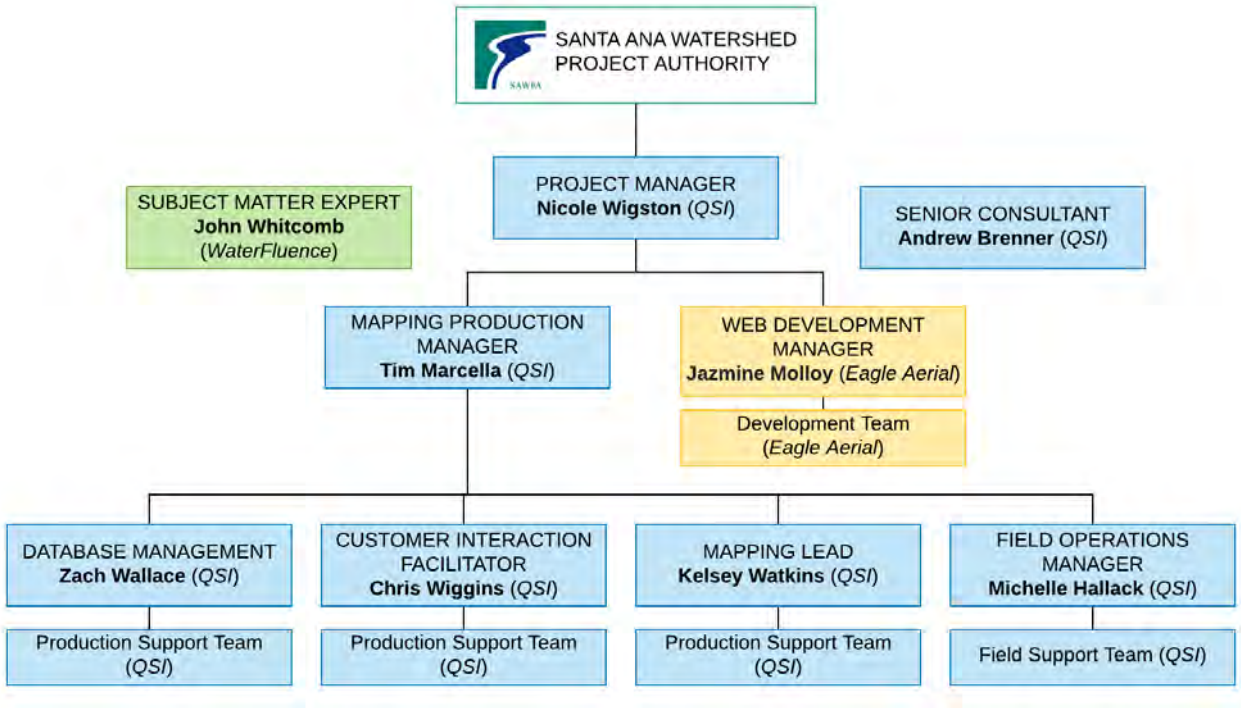


Figure 1. QSI Team organizational chart illustrating key personnel, roles, and lines of authority for the SAWPA/MWDOC Water Efficiency Budget Assistance project.

4.2 Personnel Qualifications

Table 2 provides a summary of QSI Team key personnel, their assigned roles, credentials, education, and experience relevant to the SAWPA/MWDOC Water Efficiency Budget Assistance contract.

Table 2. Key Personnel Qualifications Summary

Name, Firm	Role in this Contract	Education	Relevant Experience
Nicole Wigston *Quantum Spatial*	Project Manager	Grad. Certificate: Instructional Design & Technology, E-learning, 2012 BA, Geography, University of South Florida, 1997	Managing project teams using Agile/Scrum methodology, developing and delivering training materials on a variety of Esri technologies, and geospatial data in enterprise Geographic Information System (eGIS) geodatabases. Effective facilitation of groups in a collaborative atmosphere. Strong understanding of the project management lifecycle including scope and delivery criteria development, risk detection and management, project schedule development, customer expectation management, project team development and management, and project status reporting.
Tim Marcella *Quantum Spatial*	Mapping Production Manager	MS, Wildlife Science, Oregon State University, 2014 BS, Geographic Science, James Madison University, 2005	Project and program management with adherence to budgets and schedules; Facilitation and management of large dynamic mapping projects requiring client input and feedback; Management of large GIS/database projects; Facilitation of large (100+) stakeholder engagement meetings both in person and remotely; Interview and data gathering/outreach facilitation; Technical writing and public speaking/presentations, project manager on CA DWR Landscape Area Estimates (LAE) project.
Jazmine Molloy Eagle Aerial	Web Development Manager	BA, Southern Oregon University, 2004	Experience coordinating the CA DWR statewide, residential irrigated vegetation analysis project; development of the web-based "Verification Portal" to assess the accuracy of residential irrigated vegetation datasets; expertise Expert in web development and in the "WaterView™" web-based water conservation software tool.
Zach Wallace *Quantum Spatial*	Database Manager	MS, Ocean, Earth, and Atmospheric Sciences, Oregon State University, 2019 BS, Integrative Biology, Oregon State University, 2016	Expertise in programming including training in database development and management, code development and testing, building automated quality control checks, and data structures. Experienced in Big Data management, custom scripting in multiple programming languages, client engagement and requirement gathering experience, support analyst and mapper on DWR LAE project.
Chris Wiggins *Quantum Spatial*	Customer Interaction Facilitator	MS, Geographical Information Science, Saint Mary's University, 2014 BA, Management and Communications, Concordia University, 2007	Provides technical staff oversight, client and stakeholder engagement, QA/QC manager and technical writer/metadata expert, assists in the completion of data deliverables, reports, and metadata application to the project data. Production manager on CA DWR LAE project.

Table 2. Key Personnel Qualifications Summary – Continued.			
Name, Firm	**Role in this Contract**	**Education**	**Relevant Experience**
Kelsey Watkins *Quantum Spatial*	Mapping Lead	MS, Natural Resource Management, Oregon State University, 2019 BS, Environmental Science, University of Oregon, 2015	Experienced in water use analytics and statistical analysis, custom scripting in multiple programming languages, landscape area classification, and development and execution of automated reporting methodologies to create customizable reports. Lead analyst/mapper on CA DWR LAE project.
Andrew Brenner, PhD *Quantum Spatial*	Senior Consultant	PhD, Environmental Physics, University of Edinburgh, UK (1991) BS, Soil Science. Univ. of Reading, UK (1986)	Consultation and expertise in GIS solutions for federal and regional agencies, water conservation, watershed modeling, natural resources management, forest inventory, wildlife species habitat assessment, wildfire risk assessments, and forest health.
Michelle Hallack, PhD *Quantum Spatial*	Field Operations Coordinator	PhD, Environmental Sciences, Univ. of Baja California, 2011 MS, Civil Engineering (Water Resources), Michigan Tech. University, 2005	Expertise in surface water analysis, GIS applications, storm water compliance, and storm water management plans. Also experienced in drought and flood analysis, hydrological modeling, BMPs for capture and reuse alternatives, and California stormwater compliance for municipal and industrial clients.
John Whitcomb, PhD *WaterFluence*	Subject Matter Expert	PhD, Geography and Environmental Engineering, Johns Hopkins University BA, Economics and Geography, University of California, Santa Barbara	Experienced in landscape irrigation, water efficiency, market research, statistical analysis, GIS, and water pricing. Expertise in commercial and public irrigation efficiency, and best practices for landscape management. Research PI on sensitivity to water pricing in Florida, Texas, Southwest (Arizona, California, and Nevada), and Brazil.

5.0 Slope Calculation Methods

Landscape area analysis is greatly aided by manual and model interpretation of remotely sensed data, i.e. 4-band aerial imagery. These imagery datasets hold clues and context that can be extracted to identify and quantify the landscape area on the parcels. However, the on-the-ground area of a parcel as measured with 2D aerial imagery will be underestimated on properties with a high slope. If the gradient of the parcel is uniformly sloped and horizontal, this would be referred to as the 'planar surface' of the parcel. If the parcel is complex in gradient, a more appropriate measure to account for the non-horizontal surface would be the 'surface area' of the parcel. The difference between an area's measured planar and surface areas diverges when a property has a high degree of dimensionality. For this reason, we are proposing that, for properties that meet the criteria outlined by SAWPA/MWDOC, we calculate surface area for highly sloped properties. We are proposing that a remote sensing approach can be used to effectively map a properties surface area by generating a slope raster that can be integrated into the landscape area measurement.

5.1 Remote

To correct for the slope of a parcel using a remote sensing approach, a high resolution digital elevation model (DEM) will need to be identified for the participating agencies. A statewide 10 m DEM is available, but a higher resolution lidar-derived DEM will be preferred for this type of analysis. One to 3m resolution is the most appropriate scale for this type of analysis. Upon project onset, we will work with

SAWPA/MWDOC and partner agencies to identify the most appropriate DEM for use in each participating water agency's area of interest.

Once the most appropriate DEM is identified, we will calculate a slope map using the spatial analyst tool kit in ArcMap. With the slope map generated, we will take the inverse square root of the cosine of slope (in percent) multiplied by the area of each individual pixel. The value of this equation represents the slope-adjusted area for each pixel in the raster. The output of this equation will be written to a new raster layer. With this layer created, the meter service area for each dedicated landscape meter customer will be intersected with the slope-corrected area raster. The elevational gradient of each component piece of the landscape area (irrigated, irrigable, and not irrigable) will then be adjusted individually to determine the surface area of each component piece of the meter service area.

5.2 Field-Based

Using field-based measurements to correct for the surface area of a parcel is not recommended for this project. Although there may be some instances in which a dedicated landscape meter customer's irrigation area will need to be confirmed through a field-based mapping effort, the correction for surface area can still be accomplished using the remote approach outlined above. While the precision and accuracy gained through a field- based land survey of the property will exceed that achieved using the remote approach, the accuracy gained will come at a significant cost that we do not feel is justified given the overall goals of this project.

6.0 Methodology for Mapping & Measuring Irrigable/Irrigated Areas

Accurately mapping landscape areas relies on a solid understanding of the classification criteria. QSI and Eagle have together worked with the Department of Water Resources as well as individual water agencies to capture the defined irrigation criteria that will be followed in each individual landscape area analysis project we have completed. Since irrigation definitions were not explicitly outlined in the request for proposals, our first step in outlining the methodology for mapping and measuring irrigable/irrigated areas will be to define the irrigation classification routine. During the kickoff meeting for this project we will work closely with the SAWPA and MWDOC senior staff to outline the classification criteria. We will then hold at least two additional technical exchange meetings where we finalize the irrigation classification key.

Once a classification key is clearly defined and documented, there are two main methods for capturing landscape areas, each with strengths and weaknesses. The first and primary method we will employ involve using remotely sensed data (e.g., 4-band aerial imagery), and the second and less efficient (in terms of time and cost) approach involves sending field crews to the site to measure the landscape area. We believe that the strengths of the remote sensing approach (lesser cost) outweigh the strengths of field mapping approach (greater accuracy). Nevertheless, below we provide a summary of our approach to mapping irrigated and irrigable areas for a meter service area using both remotely sensed data and field verification. We propose that all customers properties are mapped remotely, with field crews mobilizing only when specific information required for the project cannot be gathered using remote sensing.

6.1 Remotely Sensed Mapping Approach

QSI understands that the imagery sources available for completion of this project include the various options outlined in the RFP (Table 1, page 8). To reduce the complexity involved in displaying the imagery used in the analysis on the data delivery viewer (outlined in Section 7.6), we will recommend choosing

and using the same imagery source for all analyses. As the QSI Team has access to all 2018 imagery from the Department of Water Resources (Area Captured: 'Certain Retail Water Agencies with SAR Watershed and OC'), we propose to use this imagery for the analysis. Using the DWR imagery will ensure a timely start to this project. Although the date of capture (2018) is slightly older than other options, we believe this will have minimal if any impact on the final results of the mapping analysis, as all irrigated and irrigable areas mapped during this effort will be approved by the retail customer who has an intimate knowledge of the current irrigation status of their property. With the 2018 data as a base, we may utilize more recent consistent data when required. Ultimately, we are amenable to using whatever imagery source the water agency/SAWPA/MWDOC prefers for the analysis.

With the meter service area and meter location defined (as outlined in Section 7.4), we will run our proprietary landscape area mapping models across each customer's meter service area. With this as the starting point for the irrigated and irrigable areas, we will then 'heads-up' digitize to correct for any anomalies in the modeled output. Once a draft of the irrigation areas is complete, we will schedule an online review session with each dedicated irrigation meter customer. Prior to the meeting, we will send a series of maps to the customer (or GIS files if the customer can utilize them) to allow for review of the data prior to the collaborative web meeting. During the web meeting, our mapping technicians will share their screens and interactively walk through any requested and required edits with the customer. Once finalized, we will receive formal sign off that the working session has concluded in an acceptable final product. We will log the date, time, and customer name in the database records so there is a metadata trail showing that the review meeting occurred, and that the data were approved.

6.2 In-Field Mapping Approach

If field mapping of irrigated and irrigable areas is deemed necessary for this project, we will employ the use of the **WaterviewCII™** field mapping application to capture key features and georeferenced locations of the meter, service area boundary, and areas of irrigated and irrigable areas. The **WaterViewCII™ Field App** developed by Eagle Aerial Solutions gives the user the ability to work in the field to accurately identify CII water meters, geolocate the meters, classify the meter type, and help measure the irrigated area that the individual meters serve by drawing a polygon corresponding to the observed coverage area served by that meter. The data can be seamless integrated into the **WaterViewCII™** software solution, described below, or exported for use in other GIS environments.

Working closely with the customer, our locally-based field staff will walk the property with the GPS-enabled tablet and mark the boundaries using the field mapping application. After the extent of the irrigated and irrigable area has been defined in the field and marked on the application, the field crew will upload the file to our internally shared database location. Once loaded, our in-office mapping technicians will finalize the mapping of the irrigated and irrigable areas with the field-collected information. The area analysis (corrected for slope where appropriate) will occur using GIS software once the irrigation areas, as mapped in the final database, are confirmed as final. This will be achieved by the dedicated irrigation customer via the same screen sharing conference call process outlined in Section 6.1 above. By combining a field visit to verify some key model points, and finalizing the mapping effort through the use of desktop GIS applications, we will reduce the amount of time needed in the field, therefore reducing the cost of the in-field mapping effort when compared to a full land survey mapping effort.

7.0 Schedule and Project Approach

7.1 Task 1 - Project Management

The focus of project management is to ensure effective, accurate, on-time and compliant deliverables within budget. We understand the importance of working collaboratively with project stakeholders to achieve project objectives. This project includes many potential stakeholders, representing:

- SAWPA member agencies (Five)
  - 5-10 retail water agencies within the Santa Ana River watershed
- MWDOC
  - Up to 28 retail water agencies

We understand that QSI will be notified of the participating retail water agencies chosen to participate in this project. Each retail water agency has its own customers, with whom our technicians and staff will be coordinating to map irrigated and irrigable areas. The project manager will interface with SAWPA/MWDOC stakeholders and retail water agencies, as well as with the project team technicians and staff.

QSI's culture of effective communication and coordination is demonstrated through our successful execution of complex, enterprise-level solutions projects over the past six years. Through our implementation of the Agile/Scrum framework, tight communication between our clients and our technical teams is emphasized at every step of the project lifecycle. Our designated project manager will be the primary point of contact with SAWPA/MWDOC stakeholders and retail water agencies. Any issues impacting major schedule milestones will be immediately communicated for discussion and resolution and will be documented appropriately in monthly status reports as well as other necessary project documents such as a risk register.

All meetings will be scheduled by the PM and will be conducted using webinar technology (either Google Meet, Go To Meeting, or Teams) to facilitate remote communication with all team members, regardless of location. Azure DevOps will be used to document, prioritize, and track the progress of the backlog of project tasks.

Reporting: A **monthly progress report** will be generated by the project manager. The report will assess general project health based on schedule, budget, and resources. It will highlight key accomplishments from the past month as well as activities for the next month. Any issues will be summarized in the progress report and tracked in a project risk and issues register. Acceptance of the monthly progress report by a designated SAWPA/MWDOC lead will precede invoicing.

Once partners have been identified by SAWPA/MWDOC, the monthly report will include a section outlining specifics for each retail water agency. Reporting will include the following, for each agency:

- Date agency initiated partnership with SAWPA/MWDOC
- Non-disclosure agreement date of execution (planned or actual)
- Status of data deliveries (such as from billing records) from agency
- Number of customers and dedicated irrigation meters targeted for inclusion
- Customer type
- Number of customer budgets created to date, including number of meters per customer
- Cost per customer (using the fee proposal from Appendix 3 of this RFP) and total cost per retail water agency

- Progress on the database analysis
- Results of analysis as they become available

A **mid-project update** presentation will be conducted to communicate project health indicators, challenges, technical methodologies, and prognosis for the second half of the project. A **final report** will summarize statistics from the project deliverables including number of customers and dedicated new budgets, cost per customer and per retail water agency. QSI will present a retrospective on any problems or issues that occurred during the overall project, and a summary of how these were resolved.

Note that during the COVID-19 pandemic, in both the office and in the field, the QSI Team follows all US Center for Disease Control and Prevention guidelines and travel policies to keep all employees, clients, and the public safe, and to prevent the spread of the disease. For this project, we will respect and comply with all local, state, and federal directives and mandates relating to travel precautions.

7.2 Task 2 - Water Agency Onboarding

SAWPA/MWDOC will provide a list of partner retail water agencies, including a point of contact for each agency. Non-disclosure agreements will be made with the partner retail water agencies prior to obtaining the data necessary for the project tasks. Agreements between QSI and partner retail water agencies will first be reviewed by SAWPA/MWDOC.

The Project Manager will be responsible for facilitating responses to technical questions as they arise from all stakeholders, including partner retail water agencies and SAWPA/MWDOC. Email will be the primary mode of communication for technical questions and responses. A central repository using Google Drive for project documents will be made available online to all stakeholders, to include a compendium of questions and responses collected by the Project Manager over the term of the project.

A series of workshops will be facilitated by the Project Manager for retail water agency partners and SAWPA/MWDOC stakeholders. These workshops will include participants invited by SAWPA/MWDOC to attend. At minimum, the initial workshop will be recorded and made available to stakeholders via the project document repository. Two workshops will be conducted in the first year.

During the workshop, the project vision, goals, and methods will be communicated. The workshop content will be updated during the project lifecycle to ensure timely and relevant content. All workshop content will be discussed with SAWPA/MWDOC stakeholders. The workshop may include discussion on the data to be provided by retail water agency partners to QSI and how it will be used. Methods for engaging retail water agency customers, once identified using the data, may be discussed along with technical mapping techniques. Workshops held later in the project lifecycle may include discussion of technical challenges of the project and solutions being developed by the Team to address those challenges. Progress in working with selected dedicated irrigation meter customers will be shared, including a summary of outreach efforts, percent of the total identified customers through each defined progress gate, and any lessons learned to date. The QSI team will continue to promote the Program through its relationships with SAWPA and MWDOC members and professional organizations such as the California Water Efficiency Partnership.

7.3 Task 3 - Database Analysis

After the execution of non-disclosure agreements with retail water agencies, billing system data will be provided to QSI from the contact person for each agency. The data call from QSI will be a request to include as much customer information as is available to ascertain customer type, water usage, and

location within the service area. The data will ideally be provided in a flat table format, such as Excel, Dbase, or comma-delimited.

The data will be evaluated and processed to identify dedicated irrigation meter customers. Those customers who do not have meter location data will be flagged in the data. Those with latitudinal and longitudinal coordinates will be used to create a spatial feature class (point geometry type) for use in further analysis. A customer database will be developed by QSI, with schema devised by evaluating source data in consideration of the requirements of the deliverables in Task 4. Data from each source agency, or their providing third party consultant, will be aggregated to the customer database by mapping out source to destination attributes.

QSI will work with SAWPA/MWDOC to iteratively deliver the data analysis results, including display of the point feature class and consultation regarding how to identify meter location for those customers flagged as not having that information in the source data. Prioritization of these data by SAWPA/MWDOC will lead to finalizing the customer list for each providing partner retail water agency.

7.4 Task 4 - Measurement Analysis

The mapping component of this project will include some combination of the following: 1) mapping the dedicated meter service area (polygon vector data), 2) mapping the meter service point and/or the actual meter service location (point vector data), and 3) mapping the landscape area as defined by the irrigated and irrigable areas (polygon vector data). All area values will be corrected for slope when appropriate. The final data for this project will be delivered as a GIS shapefile or geodatabase and in tabular form to accommodate water agencies that do not have GIS capabilities. Attribute tables will be organized and delivered to SAWPA/MWDOC in two formats as outlined in Table 3.

Table 3. SAWPA and MWDOC Deliverable Formats.

Retail Agency Deliverable Format							
Customer ID from Billing System	Other Data Associated with Customer	Customer Type	Associated APN(s)	Meter Location or Meter Service Area Points (Lat/Long)	Meter Service Area	Irrigated Area	Irrigable Area
SAWPA/MWDOC Deliverable Format							
Unique Identifier[1]	Other Data Associated with Customer[2]	Customer Type	Associated APN(s)	Meter Location or Meter Service Area Points (Lat/Long)	Meter Service Area	Irrigated Area	Irrigable Area

1. *May be unique to the project (does not need to be the retail water agency's own customer identifier from their billing database)*
2. *If the retail water agency does not want to provide it, SAWPA does not necessarily need water usage data.*

As soon as a targeted list of dedication irrigation meter customers has been selected for inclusion in this analysis, QSI will work with each retail water agency and SAWPA/MWDOC to draft an outreach campaign that will be used to alert customers to the project goals and methods for data collection/customer interaction and approval of the meter service area, meter location point, and the irrigated/irrigable mapping components of the project. Although this outreach campaign will not reach all customers, we anticipate it will solicit a response from a subset of customers. We will work closely with these engaged customers first with a hope that additional customers become aware of, and help take part in, the process of mapping. We fully understand that the success of this Program relies on building an engaged customer

base. Our team is incentivized to engage with as many customers as possible to build the Program into the premier program in the State.

Once we have communicated the project goals to the dedicated irrigation meter customers, we will first map the meter service area and meter point locations, when necessary. Phone and video meetings with screen sharing capabilities will be scheduled and set up by our production mapping lead with support from our dedicated technician team. The technicians will work from a pre-designed script to walk the customers through a decision tree, asking a series of questions to result in a mapped service area boundary. The boundary will most often be created through merging predefined parcels from the master parcel data set. In addition to merging parcels, we will also extend parcel areas to capture any additional influence the meter has, such as parkway strips, medians, and right-of-ways. In addition to mapping the meter service area, we will also target the location of the meter, and map that as a point feature. This will allow customer data to be joined spatially to the meter service area.

After the meter service area and meter location are mapped, our technicians will prime the customer on the landscape area mapping protocol and classification. The technician will work through another set of decision trees and scripted questions to engage the customer as to what areas the meter irrigates directly. Compiling notes and direct draft mapping of the landscape area will be prioritized during this part of the interview. Upon completion of the interview, the technician will schedule a follow-up interview with the customer and explain that a PDF map product will be delivered prior to the final certification meeting.

If field verification is deemed necessary, QSI will dispatch a local survey technician to interview the customer on the ground following a similar script and decision tree. As outlined in Section 6 above, the in-field technician will capture key locations of the meter service area and the landscape area on the **Waterview CII** field mapping application, and the mapping of the property will be completed via the aerial imagery with these known key points at a later date (see Section 6 for an in-depth outline of the process).

After the conclusion of the interview/field mapping effort, the technician will intersect the certified meter service area with the output of the modeled irrigation map and finalize the draft irrigated and irrigable mapping for the customer. Once a final draft has been completed, it will undergo a round of quality control in which the lead QA/QC manager will review the mapping for accuracy and completeness. After QC, a series of map quality screenshots will be captured over the entirety of the mapped meter service area. A brief automated report detailing the total square footage of the meter service area, the irrigated area, and the irrigable area will be generated and appended to the PDF screen captures of the mapped product overlaid over the aerial imagery. These mapped products will be emailed to the customer once complete and at least one (1) week prior to the final certification meeting.

At the certification meeting, the mapping technician will address any issues that were identified by the customer after the review of the PDF map product. Final adjustments will be made on-the-fly with the customer, reviewing the editing process through a screen sharing session. If the customer does not have access to a computer at the time of the interview, a final PDF map packet will be provided with instructions on how to certify the results of the mapping effort.

Once all edits have been finalized, the landscape area will be corrected for slope, when appropriate. Following this, the final product will be merged into the central retail agency database and the SAWPA/MWDOC database. By maintaining a strict chain of custody, QSI will ensure that the accuracy of the final product is representative of the landscape area mapping protocol and to the best knowledge of the customer.

7.5 Task 5 - Quality Control

To provide the highest quality solutions and services, help mitigate risk, and facilitate a culture of continuous improvement, QSI has integrated QA/QC measures into every step of the project approach and methodologies discussed above.

The QSI Project Manager will be responsible for QA/QC throughout the project and will keep in close contact with the project team to ensure all questions and issues relating to the project requirements and expectations are properly addressed and documented. All documents and work products described in the SOW will be reviewed by the appropriate QSI team members before being delivered to SAWPA/MWDOC. As each Task Iteration is complete, work products will be delivered. Each following task will begin with an evaluation of previous Task feedback, comments, and issues from SAWPA/MWDOC before work continues.

Our iterative stepwise approach to the project builds in SAWPA/MWDOC review and feedback cycles. QSI understands that SAWPA/MWDOC wants to help drive the success of this Program and as such QSI will provide multiple platforms for review and collaboration as the products are being developed. At a minimum, QSI will provide a random sample of five (5) meter service area mapped products to SAWPA/MWDOC for review during each engagement with a retail agency. Feedback gleaned from these reviews will be integrated into all final deliverable products. In addition to review of the final mapped products, QSI will provide SAWPA/MWDOC opportunities to "tag-along" on site visits as well as on a subset of customer interview sessions.

To maintain a high level of accuracy while producing repetitive output, such as the draft PDF map products and data reports, QSI relies on automation and scripting. Version control will be managed in each document and draft delivered product. Information on the author, date, review, and distribution will be documented in all submittals.

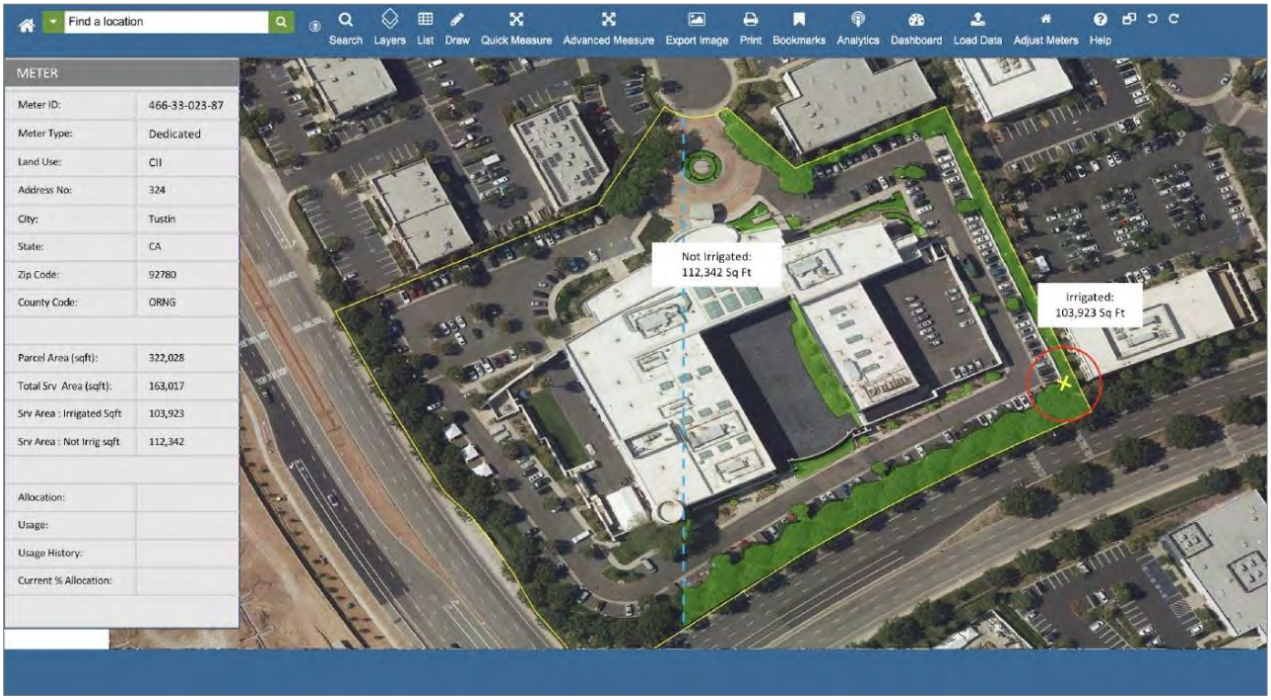
Any changes to the project schedule or deliverable due dates resulting from QC setbacks will be discussed at the monthly status meetings or when identified by the team.

7.6 Task 6 - Database for Calculating Water Budgets (Optional)

The data can be seamlessly integrated into WaterviewCII™, Eagle Aerial's designed application to manage this data and estimate water budgets, as well as provide analytical tools that districts can use to compare actual water use against estimated budgets.

WaterViewCII™ has been designed in cooperation with the non-profit California Water Efficiency Partnership to create a web-based software solution whose purpose to help agencies comply with 2018 conservation legislation (Assembly Bill 1668 and Senate Bill 606). It is specifically designed to seamlessly integrate and to maximize the conservation value of irrigated vegetation datasets, like the ones that will be generated through this project. It has been specifically designed to allow for seamless integration of these datasets. Eagle has held many focus groups with Water Districts throughout the state to try to develop this solution in the most helpful way possible for water conservation professionals throughout California. WaterViewCII™ will be continually updated with new features and capabilities, which will be added to the utilized solution as developed at no additional charge.

WaterViewCII™ provides an easy-to-use, GIS-based mapping solution that incorporates imagery data, ET data, water use data, and irrigated vegetation data. Its tools provide a wide range of up-to-date and historical performance analysis of CII irrigation and track the efficiency of water conservation efforts. WaterViewCII™ allows the user to see the attribute data collected for each polygon in the format for attribution set forth in Table 3 of the RFP (also in Table 3 of Section 7.4 above). It has user management so only selected users can use it. It will allow the user to view the Meter Service Areas, Irrigable, and Irrigated areas generated through this project, as well as the Meter Service Area Points and any Meter Location points. The application contains a base map of aerial color imagery over which project data can be displayed. Individual retailers can elect among the imagery options listed (outlined in Table 1 of the RFP), or other imagery that they might prefer. WaterViewCII™ will also provide water efficiency budget calculations for the customers included in this project. The water budget will be calculated using the formula presented in the RFP (page 6) and updated periodically with data from local CIMIS stations.



Example viewing panel of WaterViewCII™

7.7 Schedule

Project work is expected to commence in **January 2021** for SAWPA, and in **March 2021** for MWDOC, each extending for a minimum of two years (MWDOC agreement may extend for an addition 3 years).

There are several key variables that are unknown and thus make the development of a schedule with task durations challenging. The largest unknown variable is the number of customers for each retail agency. An assumed number of retail agencies helps project time to onboard under Task 2, but this does not allow for projection of time for Tasks 3 and 4. The number of customers will be determined not only by the number of dedicated landscape meter customers belonging to each retail agency (which is unknown), but also by the outcome of the Task 3 database analysis.

The work comprising Task 3 (Database Analysis) will be gauged by the state of the data provided by retail

water agencies. Discovery, assessment, and migration of data from their source to an aggregated customer list of standardized schemas will take longer if source data are not consistent (i.e., in multiple tables or formats) or cannot be readily located. The outcome of Task 3, the list of dedicated irrigation meter customers, will be prioritized by working with SAWPA/MWDOC. It is expected that major gaps in the source data records will lead to a lesser priority placed on those with such missing data.

The quality of the source data also has bearing on which customer records will readily migrate to a spatial point, such as presence and accuracy of coordinate data. Billing addresses may not equate to physical addresses, and such inconsistencies must be isolated and examined. This work will influence the duration of Task 3, and directly impact the work and duration of Task 4.

Given these unknowns, we can only outline a timeline and estimated number of interview / mapping hours for various types of dedicated irrigation meter customers (Table 4). Please note that we are one of the few organizations that has sufficient staff to resource the project with enough mapping technicians to allow for concurrent mapping efforts across multiple retail agencies at one time without impacting current workloads. Since every aspect of the final product will require approval by the customer, the remote mapping timeline for one dedicated irrigation customer will take approximately 2 hours and 45 minutes to complete and will span, on average, 5 weeks of time from initial outreach to finalized product.

Times to complete in-field mapping requirements will most likely double the level of effort as initial contact efforts, schedule, commute and field mapping as well as in office finalization will compound the time to complete one property. We estimate that our field team using the field application will be able to complete 4 sites in a 10-hour day. To minimize travel time, visits to sites will be coordinated geographically. Finally, it is to be noted that the time to correct for slope using the methods we propose in Section 5 (Slope Calculation Methods) above will not add any significant time to either the remote or in-field mapping workflow.

Table 4. Estimated time per sub-task and approximate duration of outreach interviews and mapping. n = unknown, determined by # customers.

Week	Activity	Approximate Time per Unit; Notes/Considerations
Week 1	Outreach email campaign	5 hours of project manager/production manager coordination and outreach customization per retail district
Week 2 - n	Schedule initial interview meetings	15 minutes per dedicated irrigation meter customer
Week 3 - n	Conduct initial interviews (up to 35 customers per week/per technician)	30 minute interviews/30 minute data entry/logging/finalization of draft output; goal of 5-7 interviews per technician per day. *This step can be eliminated for customers with previously mapped meter service area boundaries.*
Week 4 - n	QC and compile draft mapping output and email PDF reports for review	30 minutes per dedicated irrigation meter customer (after initial development effort has been completed to auto-generate mapping content for PDF reports).
Week 5 - n	Conduct final review interviews (up to 35 customers per week/per technician)	30 minute interviews/30 minute data entry/logging/finalization Goal of 5-7 interviews per technician per day
Week 6 - 8	(Optional and only as required) Conduct in-field interviews as necessary (up to 3 interviews per day)	2.5 hour interviews including commute, mobilization and draft mapping time

Lags in response time will extend the duration of identified tasks. There are expectations of SAWPA/MWDOC stakeholders, retail water agency stakeholders, and dedicated irrigation meter customers during this project that depend on many people outside of the QSI Team. QSI response time

will depend on the time it takes stakeholders and customers to respond, for the following key project tasks:

- Provision of customer billing data
- Execution of contracts and NDA
- Response to outreach
- Participation in remote mapping interviews
- Participation in field visits
- Signoff on map products
- Signoff on workshop materials

Regarding development time needed for Task 6, Eagle's WaterViewCII™ portal will require no further development time to implement and thus can be used for each District when the commitment is made and the data have been developed.

8.0 Fee Proposal - Appendix 3 Narrative

Appendix 3 (renamed 'SAWPA_Pricing_Appendix_3_QSI_120720') presents the QSI Team per unit pricing for all scenarios requested ("Tables 1a – 1d"; "Tables 2a – 2d"; "Table 3"). We have approached the pricing by making several assumptions outlined below. As is understood by SAWPA, this project includes both fixed costs as described in Tasks 1 – 3, and variable costs covered in Tasks 4 and 5. The pricing sheet (Appendix 3) however, only provides the opportunity to price based on variable costs. We have analyzed our anticipated costs over the two years of the project and have estimated the potential number of customers who may sign on from each District. We believe that all customers will start with a remote assessment, and field visits will be undertaken only when specific data cannot be satisfactorily collected using the head's up digitizing approach.

In our Appendix 3 pricing sheet, we have assumed that the number of DLMCs for each DLMC scope will accumulate as customers purchase the mapping service over the two years of the contract across the whole project area. So, the first 200 DLMC maps purchases for "Table 1a: Scope (no existing meter locations)" could come from any combination of Districts.

In addition, we have assumed the following rules for calculating costs from the tables provided in Appendix 3:

- 1 to 200 DLMC rate will be the unit cost for a DLMC of any customer up to 200 customers
- 1 to 500 DLMC rate will be the unit cost for a DLMC of any customer between 201 and 500 customers
- 1 to 1,000 DLMC rate will be the unit cost for a DLMC of any customer between 501 – 1000
- 1 to 5,000 DLMC rate will be the unit cost for a DLMC of any customer between 1001 – 5000.

Consequently, if for example there are 750 DLMCs in a specific scope table, we would price it as follows:

- 200 @ the 1 – 200 price +
- 300 @ the 1 – 500 price +
- 250 @ the 1 - 1000 price

= Total price for 750 DLMCs

This pricing is valid for the two year duration of the project.

Quantum Spatial is also requesting that the Program guarantee a minimum purchase of 750 DLMCs over the two years. These can fall into any DLMC rate class. We estimate that there are around 41,900 DLMCs in the SAWPA/MWDOC region so this constitutes <2% of the total DLMCs in the region. We believe that the adoption rate for the Program will be much higher than this.

Pricing is also provided for the Database ("Table 3, Optional Task"). Since this is a commercial product, we are providing the pricing structure associated with this product, of a license and cost per connection (DLMC). We are providing a discounted pricing per Water District for this solicitation. The low license cost with the addition charge for each connection linked to the database allows all Districts, large and small, the ability to utilize the database and adjust the price to their requirements.

9.0 Exceptions to the RFP Scope of Work Summary and Detailed Scope of Work

We have thoroughly reviewed the contents of the RFP' Scope of Work (SOW). The QSI Team does ***not*** have any proposed exceptions to the summary nor detailed sections of the SOW.

10.0 Exceptions to Contract Documents

QSI has thoroughly reviewed SAWPA and MCDOC's standard contract documents (Appendix 4 and 5 of RFP). We do ***not*** have any exceptions to these documents.

11.0 Appendix A - Resumes

Nicole Wigston, PMP - Project Manager

Ms. Wigston has extensive experience managing geospatial data in enterprise geodatabases, managing project teams, and developing and delivering training materials on a variety of Esri technologies. She is adept at managing Enterprise Geographic Information System (eGIS) projects, as her expertise combines her technical GIS software background with strong skills in moderation, presentation, and project management. Nicole has a strong understanding of the project management lifecycle including scope and delivery criteria development, risk detection and management, project schedule development, customer expectation management, project team development and management, and project status reporting. She facilitates groups effectively and energetically in a collaborative atmosphere. Nicole joined the QSI team after working for Esri for eighteen years. In her work at Esri, Nicole managed teams and generated complex workflows from software developers and project managers, which she then transformed into compelling and accessible training content.

Education:
- Graduate Certificate in Instructional Design & Technology, E-learning, 2012
- BA, Geography, University of South Florida, 1997

Years of Experience: 24
Years with QSI: 3

Relevant Project Experience:

Marine Minerals Information System, NOAA Office for Coastal Management & Bureau of Ocean Energy Management, 2013 - Present, Project Manager. In 6 phases, QSI has developed the MMIS, an enterprise GIS for the BOEM Marine Minerals Program (MMP) used to support resource policy decisions for outer continental shelf sand, gravel, and shell resources. The eGIS integrates MMP and partner agency geospatial data and non-geospatial information (sediment samples, bathymetry, electromagnetic, seismic, and side scan sonar surveys) into a uniform data model that enables efficient delineation of sand resources. Tasks have included eGIS system architecture, data modeling and management, ArcGIS Toolbox with integrated Python data transformation and automated process development, web app development, training, and documentation.

Navigation Portal Redesign, USACE Mobile District, 2019 - 2020, Project Manager. QSI was tasked to provide specific GIS scientific and technical services and support to CESAM-OP-J, the USACE Mobile District's Spatial Data Branch. This project involved a multi-disciplinary team of software and geospatial development contractors redesigning the USACE Navigation Portal. Responsibilities included analysis and development, data acquisition and management, and Cloud system/network administration specific to migrating the USACE Enterprise Data Warehouse (EDW) and rearchitecting the Navigation Portal to the Azure L4 Government Cloud.

Master Planning Information Tool, US Army Reserve, 2019 - 2020, Project Manager. QSI was contracted to integrate all Master Planning Information Tool (MPIT) services into an ArcGIS Portal. The project included complete integration of the existing MPIT tool into the ArcGIS Portal Web App, upgrading and modernizing the graphical user interface, adding an enhanced geostatistical analysis functionality, and providing materials, instructions, and other logistics for administration and migration.

Geospatial Grazing and Drilling eGIS Services, U.S. Bureau of Land Management, 2015 - 2018, Project Manager. This Enterprise GIS contract involved data inventory, gap analysis, data migration, and consolidation for over 186 spatial datasets across 12 western US states, to enable tracking of grazing and liquid minerals drilling activities. QSI compiled and organized data, reviewed the BLM's complex eGIS architecture, and developed four new spatially-enabled web applications to allow the agency to efficiently manage the many cattle grazing and oil & gas drilling permits on BLM lands.

Tim Marcella - Mapping Production Manager

Education:
- MS, Wildlife Science, Oregon State University, 2014
- BS, Geographic Science, James Madison University, 2005

Years of Experience: 16

Years with QSI: 6

Mr. Marcella has demonstrated success in managing large GIS and database management projects in support of QSI's state and federal clients. Tim manages irrigated vegetation detection/delineation projects for water districts in the Southwest, enterprise GIS and software application development projects, as well as forestry and hydrologic projects. He leverages his background in geographic and wildlife science to successfully execute projects, working with diverse physical, biological, ecological, technical, and environmental sciences personnel. Tim has a strong understanding of the project management lifecycle including scope and delivery criteria development, risk detection and management, project schedule development, customer expectation management, project team development and management, and project status reporting. He is knowledgeable in the Agile process for managing large dynamic projects which require client input and feedback. Using an Agile/scrum project management technique, Tim successfully coordinates and manages daily team activities, operations, and priorities, as well as designs and develops frameworks for geospatial applications.

Relevant Project Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018-Current, Project Manager. QSI was tasked to perform an irrigated landscape analysis of all 12 million single and multi-family residences in California, 400 water districts in the state. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. These data were obtained, quality controlled and reprocessed in preparation for the feature extraction. Ancillary data required for the project were the parcel boundaries for urban areas in California. Tim provided oversight on the resource allocation and QA/QC of the feature classification. Tim also prepared and presented content at six stakeholder engagement meetings aimed to keep the water agencies, state water board and NGOs informed on the program milestones.

2018/2019 Irrigated Vegetation Mapping, California Water Services Company 2019-Current, Project Manager. Quantum Spatial was tasked with providing a mapped landscape area product for roughly 500 square miles of water districts management by the California Water Services Company. The highly accurate product is being used by the client to set water budgets at the customer level. Using proprietary machine learning algorithms, Tim managed a group of technicians, analysts and specialists to complete the 2018 mapping effort and the team is currently working to finalize the 2019 update.

Irrigated Vegetation Mapping and Rebate Program Analytical Services, Santa Margarita Water District, 2018-2020, Project Manager. Quantum Spatial was contracted to provide a landscape area changed detection analysis for the Santa Margarita Water district to determine the overall impacts of a turf rebate program. The analysis was aimed to determine the overall water savings in gallons per square foot of turf removed as well as investigate if the rebate program had any ancillary impacts on the ways non program participants managed their landscaping. The project was run in three phases with a detailed project report and analysis delivered at each phase. Tim was responsible for managing client relations, resourcing the project and ensuring the overall success of the phased analysis.

Forest Land Carbon Assessment, Shasta Cascade Timberlands LLC, 2020, Project Manager. Quantum Spatial was contracted by Shasta Cascade Timberlands LLC to provide forest biometric analysis for properties on the Shasta Cascades Timberlands in Northern California. The inventory resulting from this analysis will support ongoing timber management of the area of interest by New Forests and support the design of a forest carbon offset project. Tim

managed all aspects of the project including client and stakeholder engagement and successfully delivered the project on time and on budget.

DC Hydrology Update (NHD WBD Conversion), US Geological Survey (Geospatial Products and Services Contract 3), 2017, Project Manager. For the DC Metropolitan area, QSI was tasked to update the outdated, incomplete, and discontinuous NHD/WBD data using available high-resolution spatially contiguous remote sensing data (lidar, NAIP imagery, and county-level GIS data, including critical sewer and culvert information). Using a host of existing and custom GIS and hydrographic tools, QSI developed a new hydrographic database which accounted for the complex nature of the DC urban hydrology – linking above-ground rivers, streams, and curbside rivulets to the maze of below-ground wastewater pipes. Tim provided project management oversight for all components of the project.

Cultural Heritage Predictive Modeling and Application Development, 2017, Bureau of Land Management, Project Manager. To aid the BLM in landscape level research, inventory, and resource protection planning of cultural resources, QSI developed a web application to predict the presence of cultural heritage sites within a specified area of interest based on slope and distance to water. The app is an add-on toolbar to Esri ArcGIS cultural heritage sensitivity maps to inform inventory strategies and aid in resource planning. The predictive model was deployed within a custom web application interface for use within BLM on a national level. Tim provided oversight on data gathering activities, application design, development, and deployment of the tool.

Environmental Sensitivity Index (ESI) and ESI Atlas - New York/New Jersey, North Carolina, West Florida, NOAA, 2015 – 2017, Project Manager. Tim was the lead biologist and Project Manager on three task orders to update regional GIS databases outlining the sensitive coastal resources under contract with NOAA's Office of Response and Restoration. Tim was responsible for weekly client updates, resource allocation, production coordination (internally and with subcontractors) and QA/QC of all final products. Tim also lead a team of developers and analysts in the creation of automated atlas generation and report query tools to aid in NOAA's protection of oil sensitive coastal resources. Tim facilitated collaboration between developers and end users to tailor the final atlas creation and resource summary tools to the client's needs (USCG, EPA, NOAA, and state and local disaster response teams).

Jazmine Molloy - Web Development Manager

Education:
- BA, Southern Oregon University, 2004

Years of Experience: 15

Years with Eagle: 5

Ms. Malloy has served in a variety of project management capacities at Eagle Aerial Solutions. Jazmine oversees the coordination of Eagle's efforts in connection with the state-wide, residential irrigated vegetation analysis project being conducted on behalf of State of California's Department of Water Resources. She also served as project manager for the development of the web-based "Verification Portal" that Eagle created for use by water districts throughout California in assessing the accuracy of residential irrigated vegetation dataset being generated by DWR. Jazmine oversaw the research, design, and development of the "WaterView™" web-based water conservation software that allows water districts to combine a variety of datasets in order to assess and manage water conservation efforts at the district and individual customer level.

Relevant Project Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018 - 2020, Eagle Project Coordinator. Quantum Spatial, Inc. and Eagle were tasked to perform an irrigated landscape analysis of all 12 million single and multi-family residences in California, 400 water districts in the state. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. This data was obtained, quality controlled and reprocessed in preparation for the feature extraction. Ancillary data required for the project were the parcel boundaries for urban areas in California. Jazmine coordinated Eagle tasks with QSI with respect to this project and interacted regularly with DWR staff in the management of the project and various presentations to project "stakeholders".

Development of Verification Portal for Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018 - Present, Project Manager. DWR desired that the dataset being generated by the statewide irrigated vegetation project be provided to individual water agencies in a form that would allow the confirmation of the accuracy of that dataset. In order to accomplish this goal, each district is being provided by DWR with a "Verification Portal" that has been developed by Eagle. Jazmine has served as the project manager for this software build.

Development of WaterView™ web-based water conservation software, 2018 - Present, Project Manager. Eagle has developed a specialized web-based water conservation software called "WaterView™". This tool is designed to help water agencies meet the efficiency and allocation requirements established under the new long-term California water conservation legislation, SB606 & AB1686. WaterView™ allows water agencies to analyze total water allocation at the parcel level, in compliance with new DWR standards; help spot water use trends and track and manage over-allocation users within each district; and aid in upcoming DWR reporting requirements. Jazmine has served as the Project Manager for the development of WaterView™.

Collins Pine Forest, 2016-2017, Project Manager As a project manager, Jazmine together with a QSI technical team, produced a forest type map focused on the distribution of forest type, size and density of the vegetation across the client's ownership. As a team, they developed a custom forest classification schema and utilized 4-band imagery, LiDAR and additional data collected in the field to delineate the forest and land cover types. The final deliverable included a high resolution existing vegetation type (EVT) map, a Canopy Height Map, Bare Earth DEM, Slope, Aspect, Hill shade, Tree segmentation, and a full database of imagery and ancillary data used to develop mapping products.

Zach Wallace - Database Manager

Mr. Wallace's professional and educational background includes training in biology, oceanography, numerical modeling, and computer programming. Zach's programming experience includes training in database development and management, code development and testing, and data structures. Recently, he built automated quality checks into data ingestion and finalized product workflows, improving the quality of the data entering and leaving the modeling pipeline while substantially reducing labor hours required to deliver a finalized model. Zach also developed automated profiling tools to track parcel digitization efforts, aiding estimates of project cost and resource management. Previously, he has leveraged MODIS-Aqua and VIIRS level 3 satellite products to inform and validate initial and boundary conditions for a coupled bio-physical model of circulation and ecological dynamics in the Southwestern Atlantic Ocean.

Education:

- MS, Ocean, Earth, and Atmospheric Sciences, Oregon State University, 2019
- BS, Integrative Biology, Oregon State University, 2016

Years of Experience: 1

Years with QSI: 1

Relevant Project Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018-Current, Database Manager. QSI was tasked to perform an irrigated landscape analysis of all 12 million single and multi-family residences in California, 400 water districts in the state. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. These data were obtained, quality controlled and reprocessed in preparation for the feature extraction. Ancillary data required for the project were the parcel boundaries for urban areas in California. For this project Zach manages a PostgreSQL database of more than 50,000 single and multi-family residential parcels used for training data via custom Structured Query Language (SQL) commands and language-specific SQL bindings integrated into automated modeling workflows. He leverages ensemble machine learning techniques to predict single and multi-family residential water usage at 95% accuracy or higher. Zach also refactored scripted model finalization and FGDB generation procedures, in accordance with updated client specifications.

Florida Land Use Cover Change Study (FLUCCS), Southwest Florida Water Management District, 2020, Database Manger. Southwest Florida Water Management District (SWFWMD) tasked QSI to develop a land-use change classification process. Using an existing land-use classification and imagery from 2017 and 2020, the semi-automated process utilizes object-based image analysis (OBIA), statistical analysis routines, and spatial analysis to produce a change map, which is then classified into appropriate thematic land-use classes. Zach automated ingestion and quality checking of over 7 TB of high-resolution orthoimagery. He also Implemented and manage the version control system for the scripting engine driving the automated processing pipeline for the project.

Metlakatla Indian Community Derived Datasets, Metlakatla Indian Community, 2019, Database Manager. QSI was tasked to derive GIS datasets to support the creation of an Enterprise GIS database for the community of Metlakatla Island and neighboring islands. All data was delivered in an ArcGIS compatible (geodatabases) format that aligned with existing imagery and lidar. For this project, Zach developed a random forest model to predict vegetation series on Annette Island, Alaska, to aid with landuse planning efforts in the region.

Christine Wiggins - Customer Interaction Facilitator

Ms. Wiggins has assisted in the management of QSI's Biophysical Analytics group by cultivating exceptional talent through the hiring and training of technical staff, overseeing data quality control, providing client support, and performing project management across irrigated vegetation delineation and land-use projects. She regularly assists with client meetings to discuss production metrics and data clarifications. Chris came to QSI with a background in wetland and agricultural mapping in the Western US. Her expertise in digitizing, photointerpretation, and data management is used to ensure the data meets our client's needs through technical guidance and procedural support, all while maintaining efficiencies through monitoring production metrics. She has created procedural and technical guides to train staff on feature classification across a diversity of California landscapes.

Education:

- MS, Geographic Information Science and Natural Resource Management, Saint Mary's University, 2014
- BA, Business Management and Communications, Concordia University, 2005

Years of Experience: 9

Years with QSI: 3

Relevant Project Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018-Current, Customer Interaction Facilitator. QSI was tasked to perform an irrigated landscape analysis of all 12 million single and multi-family residences in California, 400 water districts in the state. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. These data were obtained, quality controlled and reprocessed in preparation for the feature extraction. Ancillary data required for the project were the parcel boundaries for urban areas in California. Chris provided support and management to technical staff on the digitizing, and photointerpretation of irrigated vegetation used to model and develop landscape area estimates for 400 water districts in California. Quality control was monitored through data calibration across the digitizing technical team. This calibration identified areas of disagreement in classification calls and was used to educate the group to bring consistency to the data product.

2018/2019 Irrigated Vegetation Mapping, California Water Services Company 2019-Current, Customer Interaction Facilitator. Quantum Spatial was tasked with providing a mapped landscape area product for roughly 500 square miles of water districts management by the California Water Services Company. The highly accurate product is being used by the client to set water budgets at the customer level. Chris assisted in the management and hiring of the technical production staff. She gave technical support, helped manage quality control, and measured production metrics to monitor project timelines.

Florida Land-use Change Classification System (FLUCCS), Southwest Florida Water Management District, 2018-2020, Customer Interaction Facilitator. Using an existing land-use classification and imagery from 2017 and 2020, the semi-automated land-use change classification process utilizes object-based image analysis (OBIA), statistical analysis routines, and spatial analysis to produce a change map, which is then classified into appropriate thematic land-use classes. Chris was responsible for the data management of ancillary layers such as parcel metrics for urban densities, crop type, and national wetland inventories to help technical staff make the most informed classification calls. This included initiating the pilot project phase, testing tool functionality, and applying lessons learned from the first contract to increase production knowledge, and efficiencies in the second contracted effort. Chris has assisted in hiring, training, and project management across two contract periods, working alongside technicians to provide quality control feedback, photointerpretation guidance, understanding of scale, and performance production metrics. Additionally, she helped complete data deliverables, reports and metadata application to the project data, and provided support and data clarifications in meetings with the client.

Kelsey Watkins - Mapping Lead

Ms. Watkins leads QSI's mapping team with her experience managing automated data preparation, modeling, and data packaging pipelines (from source data ingestion to deliverable product generation). Kelsey oversees the implementation of programmatic digitization and modeling quality control procedures and scripting of custom model tuning algorithms to facilitate accurate machine learning classification. She produces automated reporting methodologies to create custom reports able to describe multiple areas of interest or data summarizations. These reports utilize automated image selection and text customization and can be replicated any number of times. Kelsey regularly coordinates work for the core digitization team, provides oversight of digitization quality standards and is responsible for final review and approval of classifications of mapped areas.

Education:
- MS, Natural Resources, Oregon State University, 2020
- GIS Certificate, Oregon State University, 2019
- BS, Environmental Science, University of Oregon, 2015

Years of Experience: 2.5

Years with QSI: 2

Relevant Project Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources and NOAA Office of Coastal Management, 2018-Current, Mapping Lead. QSI was tasked to perform an irrigated landscape analysis of all 12 million single and multi-family residences in California, 400 water districts in the state. The mapping of the irrigation status of each parcel was developed from 1 ft, 4 band summer leaf-on imagery captured in 2018. These data were obtained, quality controlled and reprocessed in preparation for the feature extraction. Ancillary data required for the project were the parcel boundaries for urban areas in California. In order to achieve and maintain high classification accuracy, Kelsey implemented programmatic digitization and modeling quality control procedures. She also scripted custom model tuning algorithms to facilitate automated and supervised model building that allowed each classification to accurately represent each unique water district.

2018/2019 Irrigated Vegetation Mapping, California Water Services Company 2019-Current, Mapping Lead. Quantum Spatial mapped a landscape area product for roughly 500 square miles of water districts management for the California Water Services Company. The highly accurate product is being used by the client to set water budgets at the customer level. For this project, Kelsey coordinated work for the core digitization team and set photo interpretation and digitization quality standards. She was responsible for final review and approval of water district irrigated landscape classifications. Kelsey developed a programmatic data packaging methodology that corrected for topological errors such as overlap or gaps in the classification, assigned water district attributes, compiled the file geodatabase deliverable, and generated a custom Microsoft Word report unique to each water district.

Forest Land Carbon Assessment, Shasta Cascade Timberlands LLC, 2020, Analyst. Quantum Spatial was contracted by Shasta Cascade Timberlands LLC to provide forest biometric analysis for properties on the Shasta Cascades Timberlands in Northern California. The inventory resulting from this analysis will support ongoing timber management of the area of interest by New Forests and support the design of a forest carbon offset project. Kelsey was responsible for source data ingestion and organization, as well as literature review, analytical process development, deliverable report organization, and cartographic figure creation.

Forest Biometrics Assessment, Jackson State Forest, 2018-2019, Intern. Quantum Spatial was contracted by USGS to collect lidar and hyperspectral imagery in order to complete a forest biometric analysis for Jackson Demonstration State Forest in California. The inventory resulting from this analysis supported the mission of the California Department of Forestry and Fire Protection (CAL FIRE). In preparation for the analysis, Kelsey compiled, geolocated, and spatially rectified client supplied reference data. She then implemented machine learning and model validation procedures for the prediction of lidar and spectrally derived forestry metrics related to forest structure, composition, and yield.

Andrew Brenner, PhD - Senior Consultant

As a Senior Program Director for Quantum Spatial, Dr. Brenner brings together company-wide skills to produce reliable solutions in geospatial analysis. Through his leadership, QSI has developed GIS systems for multiple federal agencies. Andrew is a specialist in natural resource management, with experience in forestry and agriculture in tropical and temperate environments and he has been involved in user needs assessment work for multiple forestry organizations, including the Forest Service and Michigan Department of Natural Resources. He has led projects on forest inventory, watershed modeling, wildlife species habitat assessment, wildfire risk assessments, and forest health. In addition, Andrew has led the development of feature extraction work in forest stand mapping, crop identification, ecological alliances, and vegetation health assessments for federal mapping programs such as the National Land Cover Dataset (NLCD) for USG,S and the Coastal Change Analysis Program (C-CAP) for NOAA Coastal Services Center. More recently, Andrew has supported user need assessments to support the design and implementation of enterprise GIS systems using both Citrix and Web technologies.

Education:
- PhD, Environmental Physics and Forestry, University of Edinburgh, UK (1991)
- BS, Soil Science. University of Reading, UK (1986)

Professional Affiliations:
- American Society of Photogrammetry and Remote Sensing (ASPRS)
- Society of American Foresters

Years of Experience: 30
Years with QSI: 10

Relevant Experience:

Statewide Irrigated Vegetation Baseline Analytics, California Department of Water Resources (CADWR), 2018 - Present, Program Director. QSI has performed an irrigated landscape analysis of ~12 million single- and multi-family residences, over 403 water districts, in California. Irrigation status mapping was developed from 1 ft, 4 band leaf-on imagery captured in 2018. These data, in addition to urban area parcel boundaries, were obtained, reviewed for quality, and processed in preparation for feature extraction.

Land Use / Land Classification Change Mapping, Southwest Florida Water Management District (SWFWMD), 2018 - 2019, Program Director. SWFWMD tasked QSI to develop a land-use change classification process. Using an existing land-use classification and imagery from 2011 and 2017, the semi-automated process utilizes object-based image analysis (OBIA), statistical analysis routines, and spatial analysis to produce a change map, which is then classified into appropriate thematic land-use classes.

Geospatial Technology and Application Center (GTAC), U.S. Forest Service, 2017 - 2018, Program Manager. For GTAC, tasking has included the Enterprise Data Warehouse which archives USFS land data including imagery, Phodar and lidar, and web mapping operations such as the Interactive Visitor Map. Andrew has been responsible for understanding USFS needs and on-going tasks to design solutions for GTAC tasking.

National Agriculture Imagery Program (NAIP), U.S. Dept. of Agriculture FSA, 2016 - 2018, Remote Sensing Services Manager. Andrew has served as the Remote Sensing Services Manager for all facets of NAIP projects over the last three years. In addition, Andrew has led several land cover databases, irrigated vegetation analysis, and feature extraction projects that rely on NAIP imagery as source data. He has significant knowledge of the program and of multiple potential uses for the imagery.

Manti-La Sal Lidar, USFS Region 4, 2017, Account Manager. Lidar data were collected over nearly 25,000 acres in the Manti-La Sal National Forest in Utah to evaluate vegetation, fire, and recreation activities, and to help identify landscape scale information on cultural resource sites. Andrew provided guidance and project design consultation.

Ele-Hydro Pilot, USGS Surface Water Division, 2016 - 2017, Senior Consultant. QSI was tasked to evaluate the efficacy of updating the National Hydrography Dataset using existing USGS-compliant QL2 (2 pulses/sq. m) lidar data

from 3D Elevation Program. The pilot was performed on five diverse watersheds with the goal of evaluating the level of effort necessary to generate improved hydrographic data at three levels of detail and complexity, and to extrapolate implementation scenarios for a NHD update at a national scale. The data has been integrated into the main USGS data repository. Andrew developed the work plan and supported the execution of the project.

Environmental Sensitivity Index (ESI) Updates, NOAA Office of Response and Restoration, 2014 - 2017, Senior Consultant, SME Plants, Habitat & Human Use. To reflect changes following Hurricane Sandy (2012), QSI was tasked to update the shoreline and the biological and human use component of the Environmental Sensitivity Index (ESI) for the coasts of New York/New Jersey Metropolitan Area (last updated 2001), the Hudson River (2006), the south shore of Long Island (2009), and coastal North Carolina (last completed in 2011). Andrew provided technical assistance on plants, habitat, and human use classifications and analysis.

Michelle Hallack, PhD, EIT, QISP - Field Operations Coordinator

Ms. Hallack has a doctoral degree in Environmental Sciences from the University of Baja California, a Master of Science in Civil Engineering with an emphasis in Water Resources from Michigan Technological University, and a bachelor's degree in Civil Engineering from the University of Sonora. She is an Engineer-in-Training (EIT) in Civil Engineering, QISP, and has eight years of experience in integrated water resources engineering projects, geographic information systems (GIS) applied to water resources, as well as multidisciplinary environmental research projects. She specializes in surface water analysis applications using deterministic and probabilistic approaches, drought and flood analysis, hydrological modeling, climate change impact analysis, and BMPs for capture and reuse alternatives. She has experience in California stormwater compliance for municipal and industrial clients and she has provided support in water resources projects for Los Angeles, San Diego, and Orange Counties. Her areas of expertise include surface water analysis, GIS applications, storm water compliance, and storm water management plans.

Education:
- PhD, Environmental Sciences, University of Baja California, 2011
- MS, Civil Engineering (Water Resources emphasis), Michigan Technological University, 2005
- BS, Civil Engineering, University of Sonora, 2000

Certifications:
- Engineer-In-Training (#163590)
- Qualified Industrial Stormwater Practitioner (QISP #00900)
- Professional Certificate in Construction Project Management, San Diego State University

Years of Experience: 19
Years with QSI: 1

Relevant Project Experience:

World Airports Storm Water Monitoring Program, Los Angeles International Airport, Project Engineer. Currently supporting the storm water monitoring program for Los Angeles International Airport (LAX). Program includes monitoring station equipment procurement, installation, maintenance, and continuous monitoring at three mass loading stations at LAX for compliance with Industrial Storm Water Permits. Preparing Exceedance Response Action, GIS modeling and mapping and Technical Reports. Monitoring includes flow and load monitoring, sampling of a full suite of priority pollutants, laboratory analysis, data management, and reporting. Conducting special study on BMP efficiency including selection, implementation and monitoring for metal removal. We also conduct industrial facility inspections at over 100 tenant facilities annually. Provides GIS services for industrial land use classification and delineation of drainage areas, industrial activity areas, BMP development and tracking, and tenant inspections.

City of San Diego MS4 Flow Monitoring, CA, Project Engineer. Deploying web-enabled system to collect accurate measurements of flow rates and trends to schedule investigations to find a meaningful source of the flow pattern.

Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring and Reporting, Santa Ana Watershed Project Authority CA, Project Engineer. Stormwater sampling to determine the total nutrient loads into the lakes from their tributaries. Annual water quality data is used to calculate loads and evaluate nitrogen and phosphorus TMDL compliance with waste load allocations.

Riverside County, CA Flood Control District SMR Transitional Wet Weather Monitoring, Project Engineer. Conducting wet weather monitoring at the mass loading stations and MS4 outfall locations. Responsibilities include field reconnaissance, equipment installations, flow monitoring, automated sample collection, and data collection. GIS mapping of wildfire affected areas.

Port of Long Beach Standard Urban Stormwater Mitigation Plan, Project Engineer. Assisted in engineering review of the revised Pier J Path Standard Urban Stormwater Mitigation Plan (SUSMPs) as they are received from Port Engineering staff, for compliance with the Stormwater Quality Post-Construction Guidance Manual (Guidance Manual).

John Whitcomb, PhD - Subject Matter Expert

Mr. Whitcomb is a behavioral scientist who has worked with over 100 water agencies on projects related to landscape irrigation, water efficiency, market research, statistical analysis, geographic information systems, and water pricing. Since 2003, John has been the Executive Director at Waterfluence, a company helping commercial and public sites with irrigation efficiency. Prior to Waterfluence, John was a consultant. He managed four projects for the California Urban Water Conservation Council regarding toilet water savings; produced handbooks on implementing best management practices with large landscapes (BMP 5) and commercial, industrial, and institutional customers (BMP 9); and designed programs to minimize participant "free-riders". He was also the principal investigator of major studies measuring customer understanding and sensitivity to water pricing in Florida, Texas, the southwestern U.S. (Arizona, California, and Nevada), and Brazil.

Education:
- PhD, Geography and Environmental Engineering, Johns Hopkins University
- BA, Economics and Geography, University of California, Santa Barbara

Years of Experience: 17

Relevant Project Experience:

Commercial, Irrigation, and Institutional Irrigation Assessments, Bay Area Water Supply and Conservation Agency (BAWSCA), 2003 - Present, Program Director. Since 2003, Waterfluence has worked with BAWSCA to support the optimization of outdoor irrigation for commercial entities. Participating agencies include: Alameda County Water District, City of Brisbane, City of Hayward, City of Menlo Park, City of Millbrae, City of Redwood City, City of San Bruno, City of Foster City (Estero), and the Mid-Peninsula Water District.

Commercial, Irrigation, and Institutional Irrigation Assessments, Santa Clara Valley Water District (Valley Water), 2013 - Present, Program Director. Waterfluence supports the optimization of outdoor irrigation for commercial entities in the Santa Clara Valley. Participating agencies include: City of Gilroy, City of Milpitas, City of Morgan Hill, City of Mountain View, City of Palo Alto, City of Santa Clara, City of Sunnyvale, San Jose Municipal Water System, and San Jose Water Company.

Commercial, Irrigation, and Institutional Irrigation Assessments, Solano County Water District, 2017 - Present, Program Director. Beginning in 2017, Waterfluence has worked with Solano County to support the optimization of outdoor irrigation for commercial entities. Participating agencies include: City of Fairfield, City of Vacaville, City of Vallejo, and the Suisun-Solano Water Authority.

Irrigated Area Assessments, Town of Castle Rock, 2018 - 2019, Program Director. Waterfluence was tasked to measure irrigated landscape areas for Homeowners Associations (HOAs) in Castle Rock with dedicated irrigation meters. Measurements were completed using ArcMap.

Landscape Area Assessments, California Water Service Company (Cal Water), 2009 - 2017, Program Director. Over the course of eight years, Waterfluence was tasked to measure landscape areas for 1400 commercial and public sites in the Cal Water service area.

Landscape Area Assessments, Regional Water Authority, 2013 - 2016, Program Director. For this project, Waterfluence measured landscape areas at 700 large commercial and public sites. Participating agencies included: Placer County Water Agency, City of Folsom, El Dorado Irrigation District, City of Carmichael, and the City of Sacramento.

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PA 22 COMMITTEE MEMORANDUM NO. 2021.2

DATE: February 9, 2021

TO: Project Agreement 22 Committee

SUBJECT: Approval of Request for Proposals | 2021 Upper Watershed Aerial Imagery

PREPARED BY: Dean Unger, Information Technology Manager

RECOMMENDATION
Approve distribution of the 2021 Upper Santa Ana River Watershed High Resolution Aerial Imagery Request for Proposals (RFP).

DISCUSSION
In order to implement the Enhancements to Watershed-Wide Water Budget Decision Support Tool Project (Project), SAWPA has worked with the PA 22 member agencies and the Municipal Water District of Orange County (MWDOC) to develop the request for proposals (RFP) for upper watershed aerial imagery. The Project (which is funded by a Proposition 1 IRWM Round 1 grant, in-kind staff time partnership with the Bureau of Reclamation, and cost share from the PA 22 agencies and MWDOC) includes the following three tasks:

- **Task 1 – Imagery**: Evaluate and acquire imagery to evaluate landscape for the entire urbanized Santa Ana River Watershed and South Orange County.
- **Task 2 – Landscape Analysis**: Measure landscapes to provide water budgets to retail agencies to support the achievement of water efficiency targets prescribed by the State.
- **Task 3 – Decision Support Tool**: Deploy tool to enable retail agencies to analyze customer water use data to assess customer efficiency, target water over use, and serve as a mechanism for customer outreach.

In order to implement Tasks 1 and 2, SAWPA needs to procure high resolution watershed imagery. As discussed with the PA 22 Committee, the Orange County portion of the watershed (i.e. Orange County Water District and MWDOC service areas) will be receiving high resolution 2020 imagery from their partnership with the Southern California Associations of Government (SCAG). SAWPA, and its partner on the Project for Task 2, the Bureau of Reclamation, will also have access to this imagery. To acquire imagery for the rest of the watershed, SAWPA has developed the following RFP using SAWPA's 2015 high resolution imagery RFP as a template. That RFP was utilized to contract with the firm Geophex Ltd. to acquire summer 2015 3-inch per pixel resolution imagery across the entire Santa Ana River Watershed and portions of the Upper Santa Margarita Watershed. The Geophex Ltd. contract was funded by the Proposition 84 IRWM 2014 Drought Round grant agreement with the Department of Water Resources (DWR).

This new RFP is similar to the 2015 RFP as it asks for consultants to propose prices for a range of different resolutions including 3-inch, 6-inch and 12-inch pixels. And like the 2015 RFP, it includes the provisions that the imagery would be available to the member agencies, in addition to being available for the Project.

Major changes from the 2015 RFP include:

A. The imagery area is the upper watershed (doesn't include Orange County due to SCAG-partnership with OCWD and MWDOC),
B. The flight paths are to be centered around retail water agencies in order to reduce the time needed to post-process the imagery,
C. The inclusion of elevation deliverables that allow for SAWPA to make slope adjustments for hilly areas within the upper watershed as well as Orange County, and
D. The inclusion of a web-based dashboard so SAWPA, and the SAWPA member agencies if interested, can conduct QA/QC of imagery shortly after its flown.

The schedule for the RFP dissemination and eventual contract to be provided to the PA 22 Committee is proposed below:

RFP Issued	February 9, 2021
Bid Proposal Deadline	March 9, 2021
SAWPA Evaluation Period	March 9, 2021 – March 15, 2021
Final Negotiations/Optional Virtual Interview	March 15, 2021 - April 1, 2021
PA 22 Committee Final Contract Approval	April 13, 2021

SAWPA hopes to have the consultant acquire the imagery as close as possible to the summer 2021 solstice (June 20, 2021) to minimize shadows. The RFP allows the consultant to provide a specific schedule around that date. A final schedule for the imagery flight will be determined when SAWPA receives the RFP responses, and coordinates with the SAWPA member agencies.

BACKGROUND

The time frame to complete the overall Project is approximately three years (from early 2020 to late 2022) at an estimated total cost of $1,728,707 as shown in the budget below:

Table 1. Overview of Project Budget

Prop 1 IRWM Grant	Reclamation Support	Cost Share*	Total Cost
$500,000	$597,500	$631,207	$1,728,707

*For both upper watershed and Orange County

The Project will create water budgets based on efficiency at the customer and retail water agency scale through the collection of aerial imagery, weather and other data. It will then be implemented by analyzing high resolution imagery with the aid of imagery processing software to create area measurements of vegetation that is deemed to be irrigated (or has the potential to be irrigated) by the software. By making the water budgets available to retail water agencies through an online decision support tool, retail water agency staff will be able to compare the Project's water budgets and their customer's usage.

CRITICAL SUCCESS FACTORS
The following OWOW critical success factors are addressed by this action:

1. Administration of the OWOW process and plan in a highly efficient and cost-effective manner.
2. Data and information needed for decision-making is available to all.

RESOURCE IMPACTS
As shared with the Committee at their July 2020 Committee meeting, the estimated imagery costs are $439,300 (approximately $220 per square mile) and would be shared by the upper watershed SAWPA member agencies. The cost share, using the $439,300 estimate, to the upper watershed SAWPA member agencies is shown below in Table 2. SAWPA staff has worked with the SAWPA member agency member agencies and developed the following cost share allocation for three-inch resolution (four color band) imagery that averages three criteria of their service areas:

- Population,
- Square Mileage,
- Parcel Amount.

The eventual costs from the RFP bidders will likely different than the $439,300, if so, SAWPA will apply the formula's results with the PA 22 Advisory Workgroup and coordinate on the best solution before it is brought to the PA 22 Committee for a recommendation.

Table 2. Imagery Cost Share Allocation for the Upper Watershed

Agency	Criteria						Average of 3 Criteria		
	Pop2018	Pop2018 %	Mi2	Mi2 %	Parcels	Parcels %			
EMWD	820,818	25%	557	33%	264,175	28%	29%	$	**125,873**
IEUA	864,624	26%	239	14%	231,651	24%	22%	$	**94,854**
SBVMWD	701,569	21%	352	21%	183,806	19%	21%	$	**90,220**
WMWD	926,840	28%	518	31%	272,125	29%	29%	$	**128,353**
Total	3,313,851	100%	1,666	100%	951,757	100%	100%	$	439,300

Attachments:
1. PowerPoint Presentation
2. 2021 Imagery Acquisition Request for Proposals

Approval of Request for Proposals | 2021 Upper Watershed Aerial Imagery

Dean Unger | Information Technology Manager

PA 22 Committee | Agenda Item 4.B.

February 9, 2021

Proposition 1
IRWM Grant

SAWPA

Recommendation

Approve distribution of the 2021 Upper Santa Ana River Watershed High Resolution Aerial Imagery Request for Proposals (RFP).

Overall Project Scope

Proposition 1
IRWM Grant

Formal Project Name: Enhancements to Watershed-Wide Water Budget Decision Support Tool

- Task 1 – **Imagery**: Evaluate and acquire imagery to evaluate landscape for the entire urbanized Santa Ana River Watershed and South Orange County.

- Task 2 – **Landscape Analysis**: Measure landscapes to provide water budgets to retail agencies to support the achievement of water efficiency targets prescribed by the State.

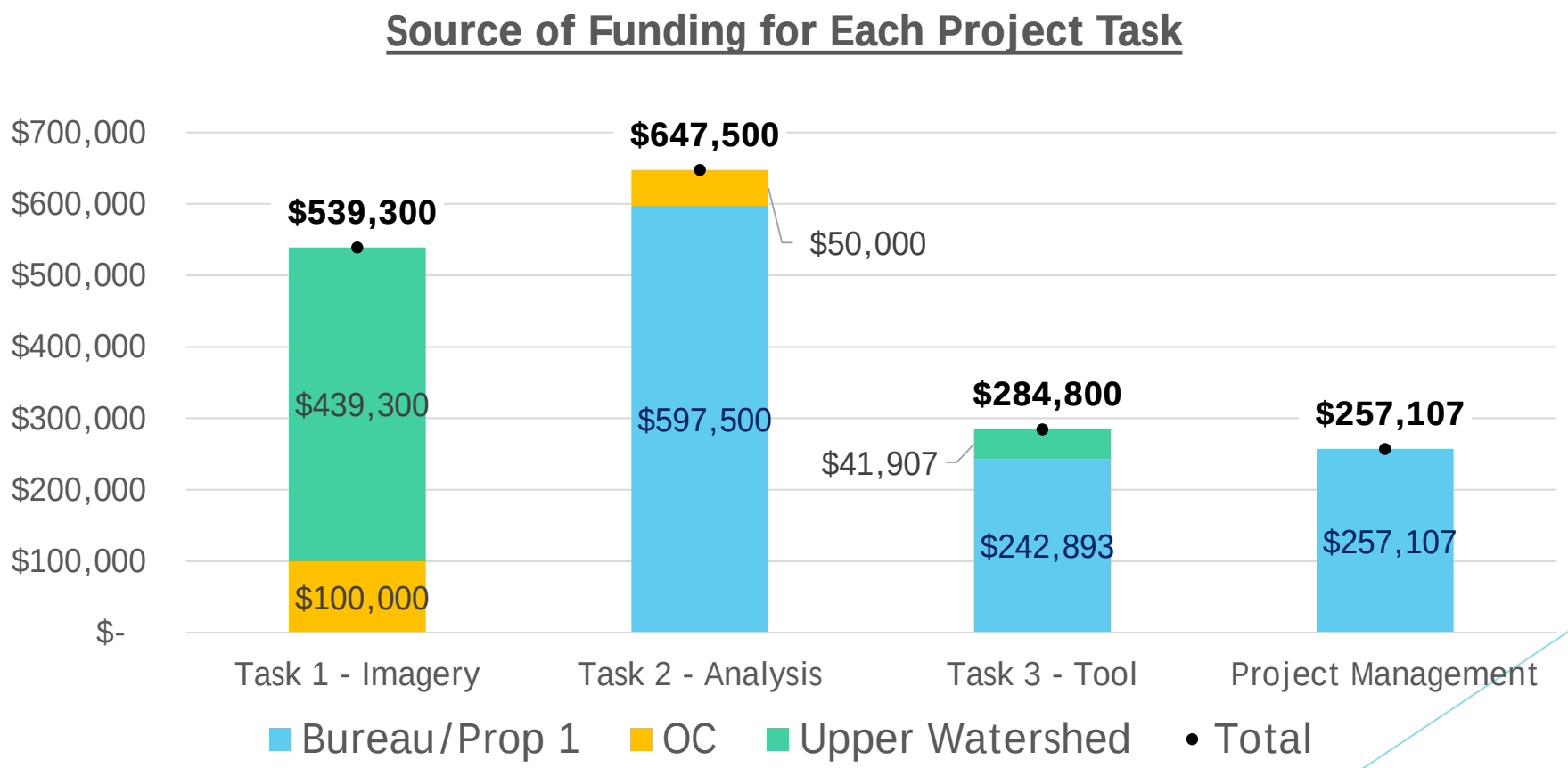
- Task 3 – **Decision Support Tool**: Deploy tool to enable retail agencies to analyze customer water use data to assess customer efficiency, target water over use, and serve as a mechanism for customer outreach.

Previous PA 22 Committee Action Related to Project

Meeting Date	Committee Action
March 2019	Approval of: 1) Application submission to Bureau of Reclamation for $597,500 in-kind staff time partnership, 2) Application submission to DWR for $500,000 Prop 1 IRWM Round 1 grant funding.
July 2020	Approval of cost share for upper watershed SAWPA member agencies using formula.
February 2021	Consider approval of RFP for upper watershed imagery and elevation measurements.

Funding for Project

Prop 1 IRWM Grant	Reclamation Support	Cost Share*	**Total Cost**
$500,000	$597,500	$631,207	**$1,728,707**

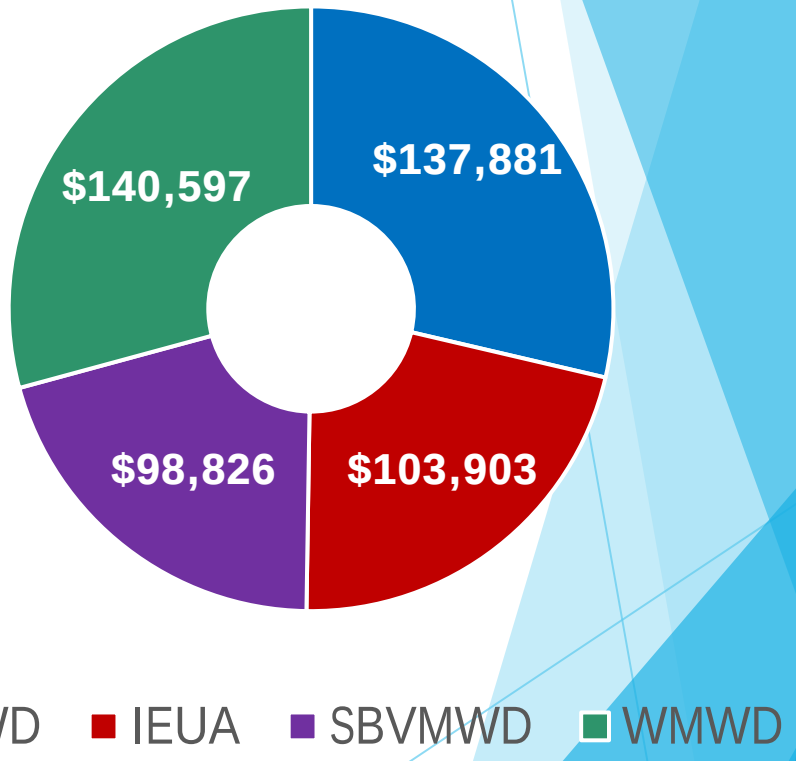


*For upper watershed and Orange County

Past PA 22 Committee Discussion

- At July 2020 meeting, PA 22 Committee agreed to formula for cost sharing 3-inch upper watershed aerial imagery.
- Formula based on values within their wholesale service areas:
  1. Population,
  2. Square mileage and
  3. Parcel amount.
- Estimated cost of upper watershed imagery shared with PA 22 Committee was $439,300 ($220 per square mile).

Project Cost Share for Upper Watershed



Totals to $481,207 ($439,300 for imagery, $41,907 for decision support tool)

Purpose of 2021 Upper Watershed Imagery

- Utilize it for Bureau of Reclamation analysis that will create outdoor water budgets,
- Utilize it for residential budgets, as well as CII budgets going forward,
- Utilize it for habitat and vegetation mapping, and
- Utilize it for water agency (including flood control) planning and engineering departments.

- The imagery will be available to the member agencies, in addition to being available for the Project.

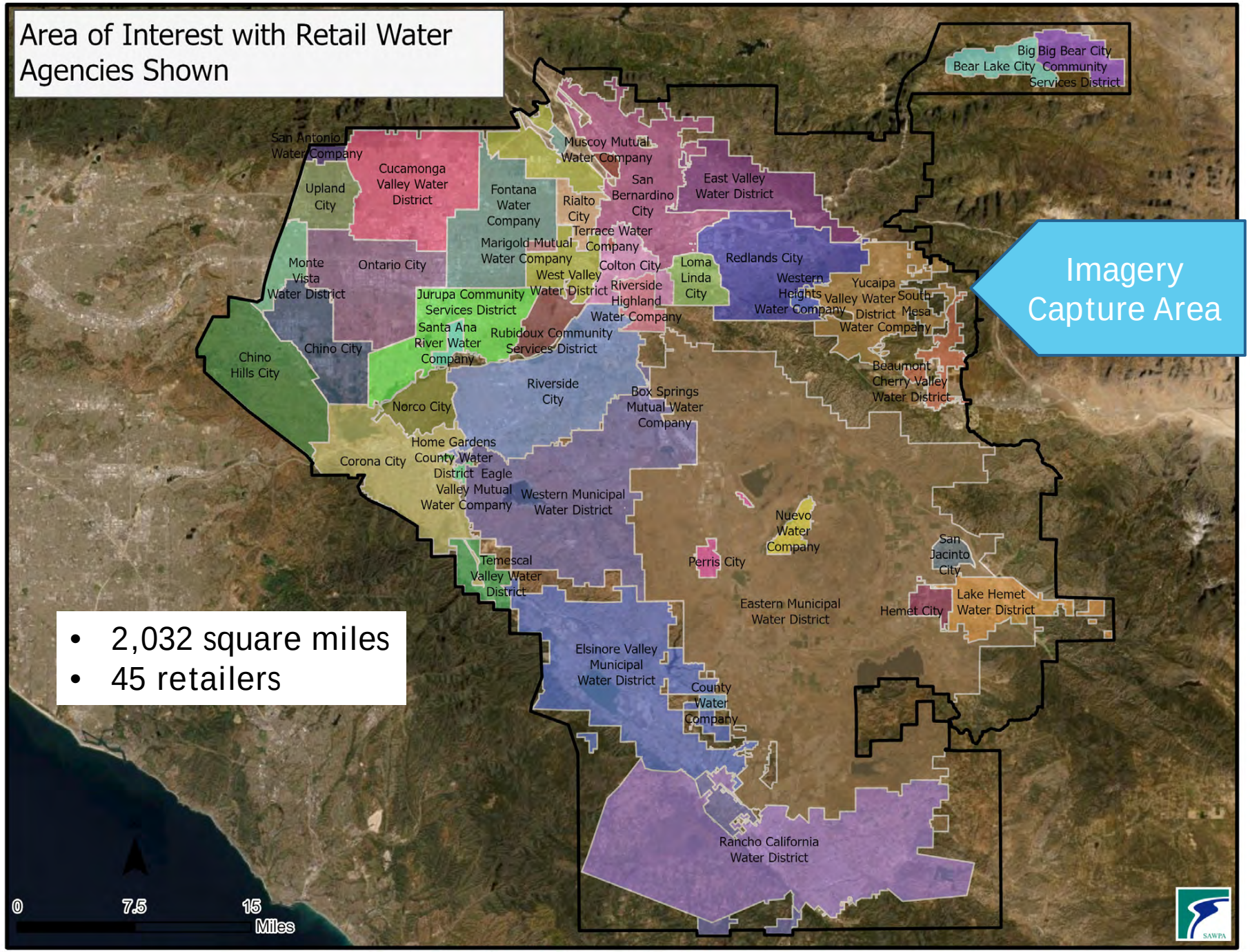
Assembly Bill 1668

Provides for the use of alternative sources of data if alternative sources are shown to be as accurate as, or more accurate than, the data provided by the department.

Request for Proposals Developed

- Similar to 2015 RFP for high resolution watershed imagery
  - Asks for prices for a range of different resolutions including 3-inch, 4-inch, 6-inch and 12-inch pixels.
- Major changes from 2015 RFP:
  - Just upper watershed,
  - Flight paths to be centered around retail water agencies,
  - Elevation deliverables that allow for slope adjustments, and
  - Web-based dashboard to QA/QC imagery after its flown.

- RFP Coordination by SAWPA
  - Coordinated with water conservation advisory group and informed GIS and planning managers of SAWPA member agencies


Area of Interest with Retail Water Agencies Shown
Big Bear City Community Services District
Bear Lake City
San Antonio Water Company
Cucamonga Valley Water District
Upland City
Muscoy Mutual Water Company
Fontana Water Company
San Bernardino City
East Valley Water District
Rialto City
Terrace Water Company
Marigold Mutual Water Company
Monte Vista Water District
Ontario City
Colton City
Loma Linda City
Redlands City
West Valley Water District
Riverside Highland Water Company
Western Heights Water Company
Yucaipa Valley Water District
South Mesa Water Company
Jurupa Community Services District
Santa Ana River Water Company
Rubidoux Community Services District
Chino City
Chino Hills City
Riverside City
Box Springs Mutual Water Company
Beaumont Cherry Valley Water District
Norco City
Home Gardens County Water District
Corona City
Eagle Valley Mutual Water Company
Western Municipal Water District
Nuevo Water Company
Perris City
San Jacinto City
Temescal Valley Water District
Lake Hemet Water District
Hemet City
Eastern Municipal Water District
Elsinore Valley Municipal Water District
County Water Company
Rancho California Water District
Imagery Capture Area
• 2,032 square miles
• 45 retailers
0
7.5
15
Miles
P:\projects\Prop1SAWPA\UpperWatershedProposalMap\UpperWatershedProposalMap.aprx LoFlightPathUW SW-3014

RFP Deliverables

- Flight Plan
- Project Control Report
- Metadata Report
- Initial Raster Imagery (not orthorectified)
- Final GEOTIFF tiles
- Compression files (ECW)
- Elevation calculation deliverables
- Bi-weekly updates
- Four meeting updates (two to Advisory Group, two to PA 22 Committee)

Available via web-portal that member agencies have access too

Major deliverables, used for imagery analysis

What is a GEOTIFF?

- Same file format from 2015 imagery project.
- GeoTIFFs files are **raster image file** types that are commonly used to store satellite and aerial imagery data, along with **geographic metadata** that describes the location in space of the image.
- GeoTIFFs are compatible with nearly all CAD and GIS applications and maintain their quality when compressed, edited, and transferred.

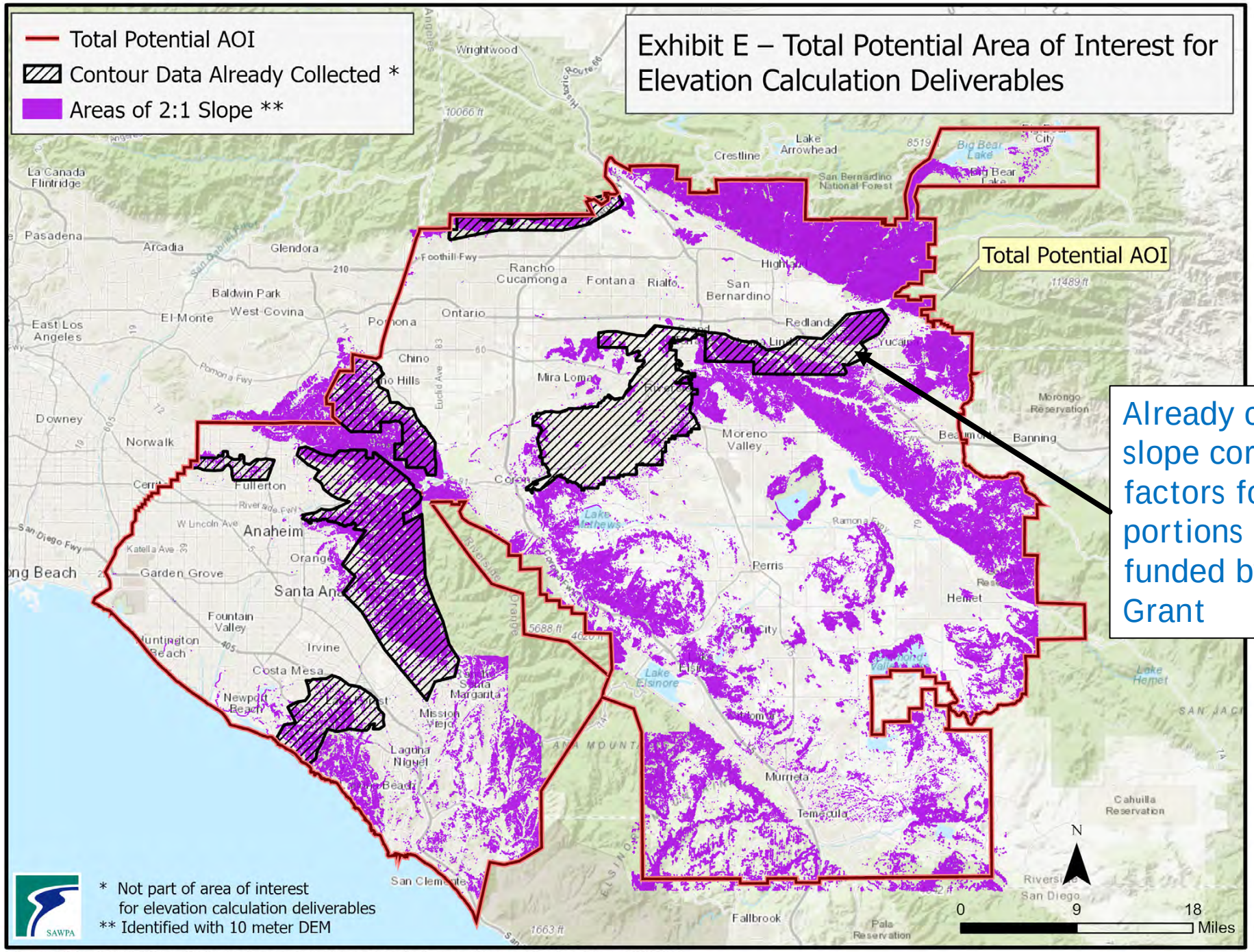
More definitions

Raster = collection of pixels
Geographic metadata = lat/long (maybe elevation) points
Orthorectified = a final product whereby every pixel appears where it is on the earth.

From: https://www.propelleraero.com/blog/what-are-geotiff-files-and-why-are-they-so-useful-in-drone-mapping/ and https://apollomapping.com/blog/g-faq-orthorectification-part

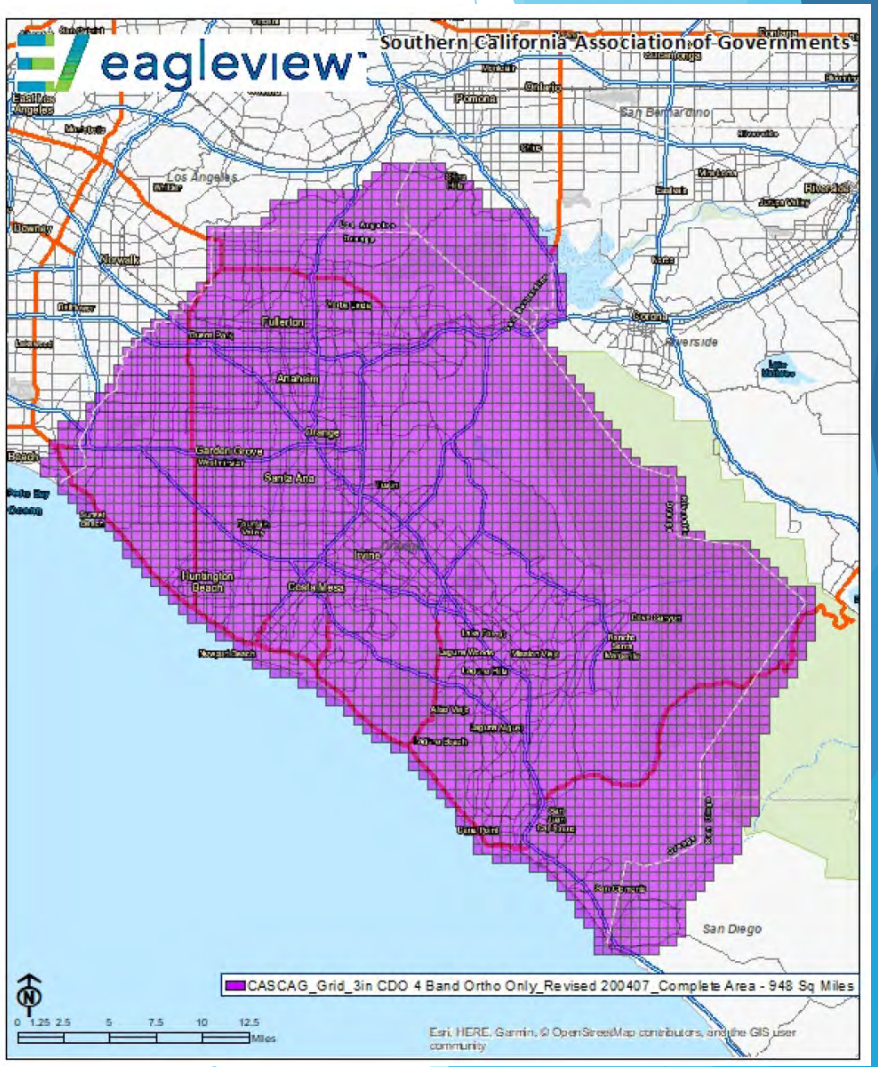
Elevation Deliverables

- Asking for a triangulated irregular network (TIN),
  - Different area of interest than imagery.
  - Area of interest excludes the areas that we already have slope correction factors due to 2015 imagery project.
  - TIN allows for slope adjustments for hilly areas.
  - Would be funded by interested retailers and wholesalers (not included in total project cost of $1.7 million).


Total Potential AOI
Contour Data Already Collected *
Areas of 2:1 Slope **
Exhibit E – Total Potential Area of Interest for Elevation Calculation Deliverables
Total Potential AOI
Already calculated slope correction factors for those portions in 2015; funded by Drought Grant
* Not part of area of interest for elevation calculation deliverables
** Identified with 10 meter DEM
SAWPA
N
0
9
18
Miles
P:\projects\Prop1SAWPA\UpperWatershedProposalMap\UpperWatershedProposalMap.aprx LoSlopedAreas SW-3015

Orange County Imagery Status

- 3-inch resolution imagery produced by Eagle View via contract with Southern California Association of Governments (SCAG),
- Final GEOTIFF files available for analysis by SAWPA and partner Bureau of Reclamation in June 2022,
- Effort funded, in part, by OCWD and MWDOC.



RFP Schedule

SAWPA's schedule for this procurement is:

RFP Issued	February 9, 2021
Bidder Q/A Period	February 9, 2021 through March 1, 2021
Close of Q/A Period	March 1, 2021 5pm PST
Final Q/A Response to Bidders	March 3, 2021 5pm PST
Bid Proposal Deadline	**March 9, 2021 by 5pm PST**
SAWPA Evaluation Period	March 9, 2021 – March 15, 2021
Final Negotiations/Optional Virtual Interview	March 15, 2021 - April 1, 2021
SAWPA Final Contract Approval	April 13, 2021

PA 22 Committee meeting

Recommendation

Approve distribution of the 2021 Upper Santa Ana River Watershed High Resolution Aerial Imagery Request for Proposals (RFP).

SANTA ANA WATERSHED PROJECT AUTHORITY

Project: IMAGERY ACQUISITION 2021

Request for Proposal
Issued: February 9, 2021
Due: March 9, 2021 5:00 PM PST

1. INTRODUCTION

1.1a Purpose and Imagery Acquisition 2021 Project (Project) Background

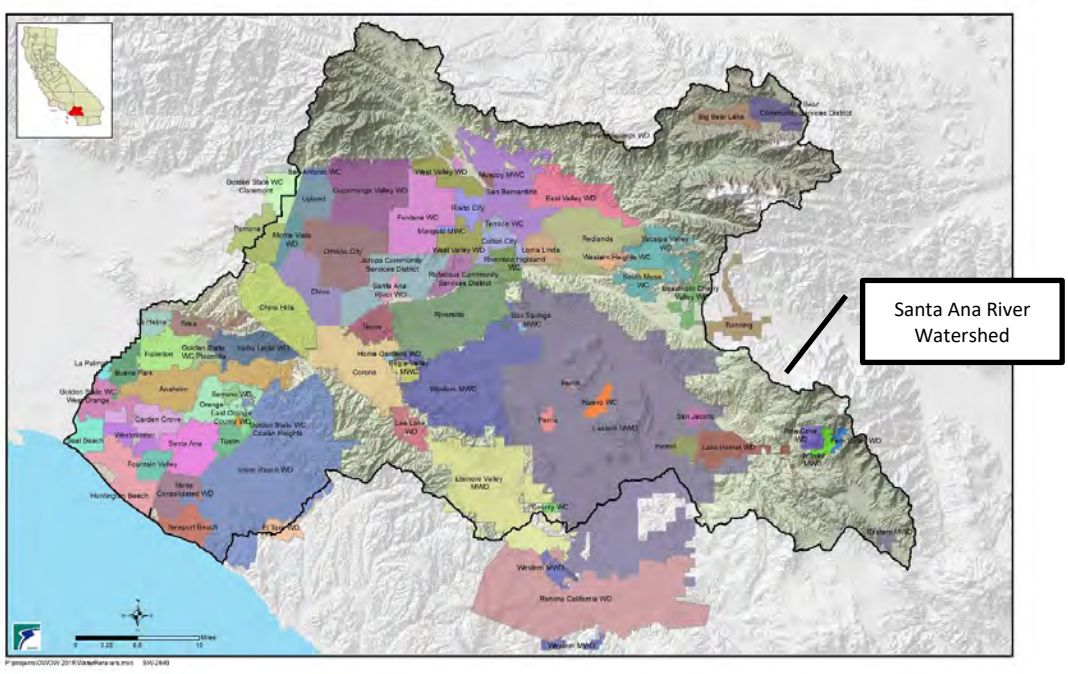
The primary purpose of this RFP is to obtain 2021 digital color four-band (R, G, B, and NIR[1]) imagery that can be used for software vegetation analysis within the Area of Interest (AOI) shown in Exhibit D. The Santa Ana Watershed Project Authority (SAWPA) is also seeking to obtain detailed surface elevation models as described in Section 3.6 for to-be determined areas within the AOI shown in Exhibit E. These surface elevation models will be used to calculate sloped area of parcels and slope area correction factors for the parcels.

1.1b About SAWPA

SAWPA was formed in 1968 as a joint power authority under California law, and is composed of five member agencies: Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District. SAWPA's office is located at 11615 Sterling Avenue, Riverside, CA 92503 and its website is www.sawpa.org.

SAWPA focuses on a broad range of water resource issues in its service area – the Santa Ana River Watershed. These include water supply reliability, water quality improvement, recycled water, wastewater treatment, groundwater management, brine disposal, and integrated regional planning.

Figure 1: Santa Ana River Watershed and Retail Water Agencies



SAWPA's stated mission is to develop and maintain regional plans, programs, and projects that will protect the Santa Ana River Watershed water resources to maximize beneficial uses within

[1] Near Infrared Reflectance.

the watershed in an economically and environmentally responsible manner.

1.2 Participating Agencies

The primary agency responsible for this procurement is SAWPA. This imagery project will assist SAWPA in carrying out their responsibilities in the project area in partnership with the Santa Ana River Watershed agencies ("Watershed Agencies") that include the five member agencies, three flood control agencies, 76 retail water agencies in the Santa Ana River Watershed, various wholesale water agencies with service areas in the watershed, the U.S. Bureau of Reclamation, and other entities including non-profits and regulatory agencies involved in the One Water One Watershed (OWOW) 2018 Update implementation process. The OWOW Plan Update 2018 is provided on SAWPA's website: https://sawpa.org/owow/owow-irwm-plans/owow-plan-update-2018/

It is not expected that this procurement will be rebid until 2024; however, SAWPA does reserve the right to cancel with 7 days' notice and without cause, the contract(s) with the vendor(s) selected as a result of this RFP and resulting award(s).

1.3 RFP Nomenclature and Project Management

Prior to contract award, the RFP responders are designated as "Bidders." When and if one or more qualified Bidder(s) is/are selected for contract award, the selected Bidder or Bidders will each be designated "Consultant." Contract specifications, terms and conditions, as well as insurance requirements, will follow SAWPA's standard practices and are presented in the attached SAWPA typical contract document, which is hereby incorporated within this RFP.

The "Project Manager" will be the primary interface between all potential bidders, actual Bidders, and the selected Consultant(s). The Project Manager will report all issues, concerns, and Consultant correspondence to the SAWPA Task Manager. Post-award, the Project Manager will be responsible for Consultant performance monitoring, coordination, communication, Consultant management meetings and site visits as required. The Project Manager will be Ian Achimore, Senior Watershed Manager.

Consultant selection will be the responsibility of SAWPA. Contract execution including contract award will be the responsibility of SAWPA. The SAWPA General Manager is the designated SAWPA official authorized to make contractual commitments on behalf of SAWPA. The terms "fee" and "pricing" may be used interchangeably in this RFP. Total price must include the aggregate of all fees, costs, and prices for all components of a specific offer. Bidders may elect to propose a "super" total price if they are offering a discount for a collection of offers. This option should be used judiciously since each offer must also stand on its own.

1.4 Scope of Work

1.4.1 Geographic Extents

The geographic area addressed in this RFP is primarily the upper Santa Ana River Watershed which extends from San Bernardino County in the north, through west Riverside County and the portions of the Santa Margarita Watershed covering west Riverside County down to the San Diego County border. The Orange County portion of the watershed is not included in the geographic extents for the imagery portion of this Project. There are 45 retail water agencies in the flight area (AOI in Exhibit D).

However, requirements for collections in other parts of Riverside and/or portions of adjacent counties may be requested any time during the term of the contract. A shapefile in State Plane Zone 6 NAD83 Feet is provided as apart of Exhibit D to define the extents of the AOI.

1.4.2 Professional Standards and Practices

This RFP is specifically intended for aerial photography firms with the necessary equipment, experience, and personnel needed to create quality georeferenced imagery and where required, associated digital elevation models/contours in accordance with the requirements outlined in the Project Specifications. Ideally, Bidders qualified will be self-contained firms with turnkey services; in other words, their staff, experience, aircraft, processing equipment and in-house photogrammetric expertise will ensure that they can deliver professional quality products in a timely, cost effective manner. Bidders that subcontract for some part of the desired services are still eligible to bid as long as each of their subcontractors are clearly identified and the qualifications, and where appropriate, the references for those subcontractors are presented in the "prime" Bidders response to this RFP.

Employees or agents of Consultant who are experienced and skilled in their profession shall perform all services hereunder in accordance with the standards of the profession. Consultant's findings, recommendations, and professional advice shall be based on practices and procedures customary to the Consultant's profession. Consultant must employ the current industry practice in performing its services and shall provide additional services, if needed, to correct its deficiencies at no cost to watershed agencies members.

1.4.3 Multiple Offers

Potential Bidders may submit more than one offer for each unique specification. For example, the Bidder may propose an alternate flight height. In each instance, the rationale for the alternative proposal should be explained to the satisfaction of SAWPA. In the case of alternative flight heights, the Bidder must explain the rationale, such as a different camera/lens configuration than that proposed. Some Bidders may elect to propose only one option; others may provide multiple options. The goal is to insure a fair competition and proper comparison of imagery options.

IN ORDER TO ENSURE EFFECTIVE USE OF THE IMAGERY CONTRACT, EACH BIDDER MUST PRESENT A FIXED PRICE PER SQUARE MILE FOR THE TOTAL AOI AT A GIVEN PIXEL RESOLUTION. THIS FIXED PRICE SHALL BE APPLIED TO ALL FUTURE ORDERS. THE RESOLUTIONS REQUIRED ARE 3 INCH/PIXEL, 6 INCH/PIXEL AND 12 INCH/PIXEL.

Since most if not all bidders will be flying 4 band digital cameras it is expected that the additional cost for the alternative spectral content will be a small portion of the primary deliverable.

ALL BID ITEMS AND ASSOCIATED PRICES MUST COVER THE TWO YEARS OF THE INTENDED CONTRACT TERM. SAWPA'S GOAL IS TO OBTAIN THE BEST IMAGERY AND ASSOCIATED DATA SETS AT THE HIGHEST QUALITY AND BEST PRICE PER SQUARE MILE. FINAL VENDOR SELECTION WILL BE BASED ON PRICE AS WELL AS TWELVE OTHER FACTORS OUTLINED IN THIS RFP. ALL THIRTEEN FACTORS WILL BE USED TO DETERMINE FINAL VENDOR SELECTION.

1.4.4 Multiple Vendor Selection

The purpose of this project is the timely acquisition of quality imagery that meets the technical specifications of SAWPA. While it is unlikely that more than one Bidder will be selected for the project, SAWPA reserves the right to select multiple vendors for different portions of the Project. SAWPA reserves the right to reject any or all offers, to waive any discrepancy or technicality and to split or award the contract in any manner determined to be the most advantageous to SAWPA.

1.4.5 Bid Options – Imagery Resolution (GSD) and Scale

The ground sample distance intended for the potential deliverables as a result of this RFP is an assortment of 12, 6, and 3 inch/pixel GSD. For any of the AOI's designated herein, the Bidder may also offer alternative GSD bid options as long as each option is accompanied by a separate cost, flight height, camera type, and any other information the bidder deems relevant. SAWPA reserves the right to request reasonable alternative GSD and other specifications and associated pricing post-award if subject alternatives are beneficial to SAWPA.

1.4.6 Bid Options Imagery Acquisition

Bidders must propose digital acquisition for the imagery. Bidders may propose alternative flight heights for the acquisition if each flight height is priced separately and as long as the proposed offer meets the specification for quality and accuracy. SAWPA recognizes that lower flights heights (photo scale) result in more photo frames and therefore higher acquisition and processing costs. SAWPA desires to acquire the highest quality imagery within the budgets allocated.

1.4.7 Index Map - Post Award/Pre-flight Requirement

A flight line index map in reproducible Adobe Portable Document Format (PDF) at a scale not greater than 1:100,000, showing topography and major features, is required. The center point of each photo shall be shown and labeled for each frame on the index, and the edge of one frame shall be shown as an example of the extent of coverage for each frame. A flight line and frame number shall be shown for each photo. The index shall contain a legend indicating photography scale, date of flight, and a depiction of the mechanics of the numbering sequence. After the AOI is completed, Consultant will provide a shapefile with metadata which includes the acquisition data of the frame, the frame extents and any other relevant information. The Consultant will also provide a shapefile showing the extents of each tile within the final deliverable AOI.

1.4.8 Bid Option – Ground Control

The Consultant shall be responsible for establishing sufficient ground control to perform the required digital orthophoto mapping. While ground control is typically established using survey methods, Bidders may propose alternative approaches to traditional survey methods as long as each approach is fully described and justified relative to the deliverable specification for each offer. Horizontal accuracy for the delivered ortho product shall be +/- 2.5 feet or better. Each offer should include the expected horizontal accuracy. Offers may include, for example, a 5 foot and a 2.5 foot horizontal accuracy version with the same extents and resolution. The reduced cost for the poorer horizontal specification must be included in the Bidder’s proposal.

All surveying shall be performed under the direction of a land surveyor licensed to practice in and by the State of California. The control survey shall be completed in accordance with accepted industry practice and the applicable provision of the California Land Surveyor’s Act. The setting

of control by airborne GPS methods is permissible as long as the Bidder's proposal describes the process for achieving the required accuracy for the final orthophotography.

1.4.9 Bid Option – Coordinates

SAWPA requires that all ground control coordinates, and data products derived therefrom, be furnished in California State Plane Coordinates, Zone 6 for Riverside County; Horizontal Datum shall be NAD 83; Vertical Datum, if applicable, shall be NAVD 88. Working units shall be in feet. Bidders may submit a proposed flight and control plan as part of their response. Some Watershed Agencies members may provide their own ground control and/or an alternative specification for the survey standard. These alternatives, if any, shall be provided to the Consultant in writing in a timely manner before imagery acquisition commences.

2. SCHEDULE

2.1 Procurement Schedule

SAWPA's schedule for this procurement is:

RFP Issued	February 9, 2021
Bidder Q/A Period	February 9, 2021 through March 1, 2019
Close of Q/A Period	March 1, 2021 5pm PST
Final Q/A Response to Bidders	March 3, 2021 5pm PST
Bid Proposal Deadline	**March 9, 2021 by 5pm PST**
SAWPA Evaluation Period	March 9, 2021 – March 15, 2015
Final Negotiations/Optional Virtual Interview	March 15, 2015 - April 1, 2015
SAWPA Final Contract Approval	April 13, 2021

SAWPA reserves the right to modify the schedule as needed and to rescind the RFP or reject all responses. One or more contracts may be awarded.

2.2 Project Schedule

Bidders should propose a detailed schedule for each of their offers. Bidders shall factor in a SAWPA QA/QC review period of the initial raster imagery that has not been orthorectified. And factor in a SAWPA QA/QC review period of the final orthorectified GEOTIFFs. Those review periods shall be shown on the schedule. The timelines of these review periods shall reflect the conditions described in Sections 3.2 and 4.4 of this RFP.

3. PROJECT SPECIFICATIONS

3.1 Collection Requirements

The imagery flight should not occur before award of a contract and issuance of a Contract. Consultant should mobilize adequate resources to insure timely capture of the various extents and flight heights. Since cloud-free imagery is required, an extension of the flight collection end-date is possible if no cloud-free days occur during the proposed collection period. The imagery shall not be captured when the ground is obscured by other factors such as flooding, excessive haze, smoke, or other obscuring atmospheric conditions. Collection shall occur in calendar year 2021 when solar elevation > 30 degrees or most optimal 4-hour window.

3.2 Flight Plan

3.2.1 Flight Plan

The Consultant shall submit to the Project Manager the proposed flight plan and shall not obtain

imagery until the Project Manager approves this flight plan. The Consultant shall capture each of the retail water agencies in the imagery AOI in the same flight day. The boundaries of the retail water agencies are included as part of the shapefiles in Exhibit D. The Consultant should discuss with the Project Manager availability and type of aircraft to perform the image acquisition.

The Consultant shall provide to the Project Manager a report (often called a Navigation Report) showing post-processing results and photo capture points. The photo points shall be in a shape file with date, time, photo location/elevation in attribute tables.

The Consultant shall obtain all necessary clearances, including military and government (Air Route Traffic Control Center) clearances to conduct the flights.

Re-flights shall be performed within 10 days (weather permitting) once feedback is received by SAWPA of deficiencies per Section 4.4 for the purpose of securing replacement images for all which fail to meet the minimum specifications set forth in the Contract. The Consultant will conduct a review within 7 days after the original flight to ensure that the imagery meets contract and Contract specifications. The Project Manager shall have 15 days to review imagery submitted by the Consultant to identify imagery deficiencies and to notify the Consultant of the deficiencies. The Consultant shall have 15 days to correct the imagery or to recollect imagery and resubmit to the Project Manager.

The Project Manager shall be the sole judge as to what constitutes “imagery deficiencies.” There shall be no additional charge for re-flights and/or imagery correction. Additional quality review will be conducted by the Project Manager.

3.3 Sensor Specification and Calibration

3.3.1 Digital

The primary imagery to be acquired shall be four-band color (R,G,B, NIR) GEOTIFFs. SAWPA expects the sensor used by the Consultant to be able to delineate sharp edges and have high spatial resolution. Forward motion compensation is helpful but not mandatory. A copy of the most recent (less than 3 years old) calibration certificate must be supplied. The sensor should be able to acquire blur-free imagery at the proposed resolutions through use of a very fast shutter speed (greater than 1/500th second) or through use of a motion-compensation device.

Consultant shall be liable for ensuring that all photography complies with industry standard tolerances for flight altitude, tip, tilt, side lap, end lap, and crab. In particular, the imagery shall be done with the optical axis of the camera as nearly vertical as possible, always kept below 3 degrees. The tilt between two consecutive exposures shall not exceed 4 degrees. The crab angle shall not exceed 3 degrees.

3.3.2 Digital Sensor

For each digital camera proposed, SAWPA prefers that a single camera sensor be used to ensure exact band-to-band registration. If a multi-camera sensor is proposed, the proposal should provide specifications regarding the band-to-band registration or discuss how a highly accurate band-to-band registration will be ensured. For each digital sensor proposed, the Modulation Transfer Function (MTF) of the sensor should be provided.

3.4 Image Production Process

The Project Manager and Consultant will coordinate on the tiling scheme during approval of the Flight Plan.

3.5 Photo Specifications – General Requirements

SAWPA requests the following specifications:

a) Four band imagery (R, G, B, NIR): 24 bit (3 bands x 8 bits/band) digital camera collections will include collection of multi-spectral imagery so that the required Color Infrared Imagery (CIR) can also be produced. b) Spatial Resolution: 3, 6 GSD and 1 foot GSD quotations are requested. Bidders may offer additional resolution options and associated pricing if they elect to do so.

b) Spatial Accuracy: The National Standard for Spatial Data Accuracy (NSSDA) provides criteria for specifying accuracy at any photo scale. Consultant shall follow the NSSDA guidelines with regard to spatial accuracy.

c) Projection: State Plane Coordinate System, Zone VI, US feet, Datum NAD83.

d) Image Format ESRI compatible GEOTIFF files are required for each tile; addition of a supplemental world file (.tfw) is required.

e) Metadata: Complete documentation on image acquisition, spatial accuracy, and other technical specifications related to image acquisition and processing is required.

f) Image Quality: Images must be free of significant defects or inconsistencies in tone, contrast or color within an individual tile and/or between adjacent image tiles; color and contrast shall be natural – no bias towards a single shade or color; samples from the same sensor proposed for this project shall be provided; image shall be free of striping, banding, washouts, and hot spots. Some allowance for high reflection over water will be made. Some feature extraction should be possible in lightly shaded areas.

g) AOI for 2021 Imagery Acquisition: The shapefiles for the Project's AOI for the imagery acquisition are attached in an electronic format to this RFP as Exhibit D.

h) A shapefile showing the photo collection points including the date and time of photo collection, camera elevation, and corresponding image name.

Bidders shall describe the specific methodology and equipment to be used for acquiring the photography and for complying with the requirements outlined in this section.

The GEOTIFF file naming convention shall correspond to SAWPA's required tiling schema; the Consultant may offer their version of a traditional aerial tiling system.

3.6 Digital Elevation Model (DEM) and Deliverables for Elevation Calculations

In order to ensure proper orthorectification, unless ground control is provided, the Consultant will be responsible for developing a professional, industry standard DEM for each Contract. Consultant shall perform the necessary Ground Survey and other steps necessary to meet the

horizontal accuracy and quality of the delivered imagery. Deviations from industry standard procedures must be discussed with the Project Manager in advance and Consultant must receive written SAWPA approval for such variations.

In addition, the consultant shall also provide triangular irregular network (TIN) surface elevation models within to-be determined areas within the AOI shown in Exhibit E. The TIN models should be detailed enough to calculate accurate sloped areas at a parcel level and be able to produce reliable 2-foot elevation contour lines. The TINs will be used by SAWPA to calculate slope correction factors within parcels. . It is expected that the TIN will need to be derived from more detailed and accurate surface data) than the DEM used for the imagery orthorectification. Various resolutions of the DEM, or similar model used by the Consultant to create the TIN, are possible. Thus, Bidders can share their prices of different resolutions to create the TIN as shown in this RFP's Exhibit A.

3.7 Project Reporting, Quality Assurance and Quality Control

The Consultant shall provide brief weekly email progress reports to the Project Manager summarizing the overall status of the project and providing details of the project accomplishments and actions taken for the subject period. Consultant shall indicate which project milestones have been met and what the next or remaining steps to be taken are.

The Consultant will provide two mid-project updates during Project implementation (one to its staff-level workgroup and one to its governing body), and then two final project updates once the Project is complete (one to its staff-level workgroup and one to its governing body). The staff-level updates will each be two-hours long, and the governing body updates will be one-hour long. The Consultant can attend these meetings virtually.

Bidders shall discuss their quality assurance/quality control plan, outlining the steps taken and the individuals responsible for ensuring the integrity of the final product.

3.8 Document and Product Ownership

Traditionally, custom imagery is purchased on a "work for hire" basis. In order to facilitate the lowest possible bid price proposals and to provide maximum licensing flexibility for the Watershed Agencies and the selected Consultant, imagery and elevation data will be purchased under a "Shared Master License" agreement. (Paragraph 3.8.2.) If at any point SAWPA elects to issue selected Contracts on a "work for hire" basis, the Consultant and SAWPA will renegotiate a mutually agreeable price and licensing terms prior to release of the specific Contract(s). For purposes of this RFP, all bidder pricing responses will assume that the "Shared Master License" form of ownership is applicable to the Contract with SAWPA.

3.8.1 Watershed Agencies Ownership

All data, designs, files, forms, graphics, images, information, photographs, plans, procedures, renderings, reports, studies, statistics, systems and any other materials produced pursuant to this project shall be the sole and exclusive property of SAWPA and the Watershed Agencies. Consultant shall deliver all final data, information, and any other materials produced under this agreement, and assign all copyright privileges to SAWPA. SAWPA may thereafter reassign copyright and license privileges.

SAWPA will take ownership of all products resulting from Contract, including photographs, enhancements and any products derived from the digital terrain models. Photo negatives, if applicable, shall remain the property of SAWPA. Consultant shall be responsible for custody of the negatives, unless and until delivery is requested by SAWPA.

3.8.2 Shared Master License

As described above, the Contract shall be issued on a "Shared Master License" basis. The deliverables of this Project may be used without any licensing fees for purposes of implementing the OWOW Plan Update 2018 (and its updates), or by SAWPA, or their consultants and contractors, for any purpose, and how Consultant may charge a license fee for other entities to use the deliverables of this Project for purposes unrelated to OWOW.

SAWPA shall not convey the Project deliverables to any entity other than the Watershed Agencies. However, Consultant shall, upon written notification from SAWPA, grant a license without fee to any entity for use in implementing the OWOW Plan Update 2018 (and its updates), such license not being further transferable.

4. DELIVERY

4.1 Project Deliverables

1. A flight plan

1. A **project control report** shall be submitted documenting all controls used for orienting the captured imagery for the project. This will include:

- Flight Line;
- Camera Calibration Report;
- CD-ROM or DVD with Final Post Processed AGPS Photo Center Point Coverage;
- Statement Specifying the Location and Storage Criteria for the Master Digital Files;
- All horizontal and vertical control points used for orienting the captured imagery submitted as part of an ESRI point feature shapefile(s).

For each digital sensor proposed, the Modulation Transfer Function (MTF) of the sensor should be provided as well as any other parameters unique to the digital sensor.

2. **Metadata Report:** FGDC compliant metadata is desirable. As a minimum, the Consultant's metadata report shall contain the following information:

- Date(s) of image collection;
- Spatial and spectral resolutions;
- Spatial accuracy of image (typically stated in circular error, RMS error or in NMAS format or NSSDA format);
- Projection and datum of imagery;
- Filters used (if any);
- Collection consultant and contact information;
- DEM (if any) and contours (if any) in conformance with NAVD88 or equivalent standard.

3. **Initial raster imagery** that has not been orthorectified and a web-based portal that allows SAWPA to QA/QC review the imagery as it is captured. Portal login shall be available to SAWPA and the others per Section x

4. An **Index Map**, which is a post-award and pre-flight requirement.

5. Hard drive(s) with the **final GEOTIFF tiles**. Addition of a **supplemental world file (.tfw)** is required. The hard drive(s) shall be USB 3.0 external hard drives. Hard drives are not returnable and become the property of the watershed agencies. The Project Manager will provide Consultant

with a logical naming scheme for the delivered media folders and for the individual image tiles. It is important to the Project Manager to be able to define the naming convention for the individual tiles.

6. **Compression file(s)** of the imagery in ECW format.

7. Report (often called a **Navigation Report**) showing post-processing results and photo capture points. A shapefile showing the photo collection points including the date and time of photo collection, camera elevation, and corresponding image name.

8. Deliverables for **elevation calculations** including: mass points, spot points, 2-foot contour lines, and break lines/

9. Brief weekly email **progress reports** to the Project Manager.

11. **Four updates** – two with staff level workgroup, two with SAWPA governing body.

4.2 Project Procedures Guide

The Consultant shall follow standard production processes and quality assurance and quality control procedures in order to ensure that all products meet the required accuracy and performance standards of these specifications.

4.3 Customer Review and Discrepancy Correction

The Project Manager or, if designated, the purchasing watershed agencies member, shall have 10 days to review submitted deliverables and notify the Consultant in writing of any deficiencies. The Consultant shall be prepared to correct the data or recollect deficient imagery within 7 days, weather permitting, after notification, and will then re-deliver the imagery within 10 days following collection.

5. PROPOSAL REQUIREMENTS

5.1 Response Submission Deadline and Proposal Protocol

Proposals must be submitted by email in a PDF format. Emails are limited to 6 MB. Facsimile machine (FAX) or mailed proposals will not be accepted.

Interested and qualified firms shall send an official email with proposal attachment or attachments. All proposals must be received by SAWPA by **5:00 pm PST March 9, 2021**. Proof of receipt before the deadline is a time and date receipt on the email. It is the responsibility of the firm replying to this RFP to see that any proposal shall have sufficient time to be received by SAWPA. Proposals must be submitted to: iachimore@sawpa.org and pvitt@sawpa.org.

There will be no public bid opening. SAWPA may elect to return proposals received after the deadline.

The electronic proposal will include the name of the Bidder submitting the proposal, mailing address, telephone number, and the name of the individual to contact if further information is desired.

Specify personnel, with resumes, to be assigned to the project. If sub-consultants are to be used, identify the responsibilities and qualifications of each. If a domestic and off-shore processing sub-contracting option is offered, both sets of responsibilities and qualifications must be submitted.

For the digital files (email attachments) the following requirements must be met:

File Identification: Your company name (abbreviated) must appear first in every file name, including the main body and cost proposal (both in PDF format) and any other submissions associated with the bid. This procedure is critical in order to ensure the correct Bidder is associated with all relevant support documentation.

All proposals are required to be signed by the individual or, if a company, the company official with the power to bind the company in its proposal. Cost of developing the proposal is the responsibility of the proposer and will not be chargeable to SAWPA. To be considered, all proposals must be completely responsive to the RFP.

5.2 Proposal Questions

Any questions, technical or otherwise, pertaining to this request for RFP **must be submitted IN WRITING via e-mail and directed to:** 1) Peter Vitt, SAWPA GIS Project Manager, pvitt@sawpa.org, 2) Ian Achimore, SAWPA Senior Watershed Manager, iachimore@sawpa.org.

Interpretations or clarifications considered necessary in response to such questions will be resolved by the issuance of formal addendum to the RFP. **The deadline for all questions is listed above in Section 2.1.** Questions received after this date and time may not be answered. Only responses to questions that have been resolved by formal written addendum will be binding. Oral and other interpretations or clarifications will be without legal or contractual effect. Any addendum will be posted on SAWPA's website **by the date listed above in Section 2.1.**

5.3 Late Responses, Modifications, or Withdrawal

Responses received after the date and time indicated will not be considered.

Responses may be withdrawn or modified prior to the response submission deadline. Responses that are resubmitted or modified shall be emailed to Peter Vitt at pvitt@sawpa.org and Ian Achimore at iachimore@sawpa.org.

5.4 Format

Each response set shall be accompanied by a transmittal letter signed by an authorized company representative, empowered with the right to bind the Bidder. This authorization letter or cover page must be scanned so that it represents the original signed RFP submission.

In order to assist our panel in making a selection, SAWPA requires that all proposals adhere to the response format outlined in this section. Proposals failing to meet this requirement may be rejected. Needlessly lengthy documents filled with extraneous material will not be favorably received. Proposals should be written specifically to answer this RFP. General "sales" material should not be used within the body of the proposal (and any additional terms or conditions on the "sales" material will be considered invalid). If desired, Bidders may attach such material in a separate appendix as additional information. It is essential that the proposal be thorough and yet concise. Avoid broad, unenforceable, or unmeasurable responses.

When responding to this RFP, Bidders shall identify their responses using the same lettering used below:

5.4.1 Proposal Main Body (Part I)

a) **Cover Letter:** Include a signed cover letter with the proposal. The cover letter should provide the following:

   (1) Brief statement of the Bidder's understanding of the project.

   (2) Name, title, phone number, fax number, e-mail address, and street address of the company representative.

   (3) Highlights of the Bidder’s qualifications and ability to perform the project services.

b) **Introduction/Company Overview:** Include the following information about the Bidder's firm:

   (1) Company name, business address, phone number, fax number and internet address.

   (2) Year the firm was established and any former names of the firm if applicable.

   (3) Type of ownership and parent company if applicable.

   (4) Location of the office or offices that will provide the project services. Include all subcontractors and outsourcing services, their location, and applicable area(s) of expertise. If all offers are not going to utilize the same team of subcontractors, then Bidder's proposal must show the composition of each team for each distinct offer or group of offers. All subcontractors, including offshore subcontractors, must be

identified including their contribution to the project. For each major subcontractor, provide all information described in this section.

(5) Brief statement of the firm's background demonstrating longevity and financial stability. Selected Bidders ("finalists") may be asked to provide a current D&B Business Report. If a firm has publicly-held debt, the Bidder may be asked to provide a Moody's Investment Service Bond Rating and/or Standard and Poor's Bond Rating. Finalists may also be asked to provide total annual revenue and an indication of the revenues associated with the provision of services relevant to its proposal.

c) **Technical Approach:** In this section, describe the Bidder's expertise with, and understanding of, the methods necessary to produce the project deliverables and meet the identified specifications.

d) **Project Team/Project Management Approach:** In this section, include a project team organizational chart and clearly identify the project manager and project team. Provide resumes of key members of the project team including sub-consultants. Describe the Bidder's ability to manage the project and meet proposed timelines. Once the Consultant is under contract, SAWPA will require that the Consultant involve SAWPA in the selection and rotation of any key project team member(s) assigned to the project.

e) **Responder's Offers:** Bidder must provide a detailed technical approach, as well as the schedule and related business and technical considerations, in separate sections associated with each offer being proposed by the Bidder.

f) 1. **Scope of Work Exceptions/Recommendations:** The Bidder may propose alternative methods as long as the resulting product is of the same or superior quality than what is required. Alternate methods must not compromise the quality or accuracy of the intended products and must comply with United States National Mapping Accuracy Standards (NMAS) and/or National Standard for Spatial Data Accuracy (NSSDA).

2. **Contract Provisions Exceptions/Recommendation:** The Bidder may propose any suggested exemptions to the Contract (i.e. the task order and SAWPA General Services Agreement).

g) **Project Resources and Schedule:** Outline equipment to be used by the Bidder to acquire and process imagery and elevation data for this project. It is also critical that Bidders identify all subcontractors to be associated with the bid proposal. SAWPA desires that all data production and processing locations be clearly identified in the Bidder's proposal; this requirement applies to potential subcontractors as well as regional or satellite offices of the Bidder (prime). Where applicable, the qualifications, equipment specifications and resources of the proposed subcontractors should also be included in the proposal.

This section should include a detailed schedule for the completion of the project deliverables identified in the proposal, and also the proposed start and end dates and intermediate delivery dates if applicable. Bidders should present their resources and their subcontractors, including availability (staffing and equipment) for the anticipated duration of the project.

h) **Project Experience:** Provide references from at least three (3) previous relevant projects. This should include a short project description that demonstrates capabilities in the project services, experience with similar clients, and/or local project experience. The name of the client organization as well as the name and phone number of the person there serving as a reference contact should also be provided. SAWPA may request additional references at any time prior to contract award.

i) **Fee Narrative:** Included a narrative, if needed, to describe the Bidder's proposed fees as shown in Exhibit A.

j) **Schedule**: Provide a detailed schedule. See Section 2.2 of this RFP for providing a response to this question.

5.4.2 Proposal - Cost (Part II)

Proposed Fee: See Exhibit A for detailed Cost Proposal Instructions and Format.

5.4.3 Proposal - Appendix

Additional Material: Any additional digital file, imagery samples (digital and/or printed) and any other materials the Bidder feels are relevant to the Bidder's response.

5.5 Duly Authorized Signature

The response must contain the signature of a duly authorized officer of the bidding entity empowered with the right to bind the Bidder.

5.6 Response Costs

The Bidder shall be responsible for all costs incurred in the development and submission of this response. Neither SAWPA nor any member of the watershed agencies shall assume any obligation as a result of the issuance of this RFP, the preparation or submission of a response by a Bidder, the evaluation of an accepted response, or the selection of finalists. Neither SAWPA nor any watershed agencies member shall be contractually bound until a written Contract has been issued.

5.7 Complete Services/Products

The successful Bidder shall be required to furnish the following:

a) All tools, equipment, supplies, supervision, transportation and other accessories, services, and facilities necessary to complete the work;

b) All materials, supplies, and equipment specified and required to be incorporated in and form a permanent part of the completed work;

c) Provide and perform all necessary labor;

d) Perform and complete the work in accordance with good technical practice, with due diligence, and in accordance with the requirements, stipulations, provisions, and conditions of the RFP and the resultant agreement.

5.8 Selection Criteria

SAWPA intends to retain the vendor whose proposal it believes is most advantageous to SAWPA. Evaluation of the proposal will be based on qualifications of the Bidders and not solely on "low bid," as SAWPA wishes to utilize a firm with significant professional credentials. While price is an important factor, it is only one of thirteen factors considered in selecting the best vendor for this project. The selection panel will consider all of the following thirteen factors (not listed in order of importance):

1. **Technical**: Soundness of the vendor's technical approach.

2. **Quality Imagery**: Ability to produce high quality imagery that meets the required specifications.

3. **Accuracy**: Ability to produce spatially accurate imagery (low RMS error) using industry standard processes. Adherence to NSSDA and nationally recognized photogrammetric and survey standards wherever appropriate for the proper fulfillment of each Contract.

4. **Management**: Project management approach.

5. **Qualifications**: Qualifications of the project team, including personnel and sub consultants, specifically technical expertise, trade proficiency, relevant experience and past performance.

6. **Availability**: Availability of the Consultant to coordinate and discuss issues with SAWPA.

7. **References**: Project references.

8. **Quality of Proposal**: Quality of proposal response.

9. **Schedule**: Proposed project schedule and evidence of ability to meet scheduled target dates, such as the summer equinox, including the overall capacity of the Bidder's team to deliver the volume of imagery associated with each offer proposed.

10. **Price**: Price factors, including total price for each offer, price per square mile.

11. **Value**: Best value for SAWPA.

12. **Business Issues**: Business standing and financial solvency as assessed from SAWPA's viewpoint.

13. **Creativity**: Unique offers or approaches to standard offer which provide beneficial and cost-effective deliverables for SAWPA.

5.9 Rejection of Proposals

This Request for Proposals does not commit SAWPA to award a contract or to pay any costs incurred for proposal preparation. SAWPA, at its sole discretion, reserves the right to accept or reject any or all proposals received as a result of this request, to negotiate with any qualified Bidder, or to cancel this RFP in part or in its entirety.

Information received will be used in validation and evaluation of the bids and may be incorporated in any subsequent contract.

5.10 Contractual Obligations

After written proposals have been reviewed, interviews and/or site inspections with prospective firms may be scheduled. The principal from a specific firm who will be directly responsible for administering the contract and the firm's Project Manager should be present for interviews and site inspections.

The successful Bidder will be required to enter into a written agreement with SAWPA under which the Consultant will undertake certain obligations. A copy of SAWPA's insurance requirements for this project is contained in Exhibit C of the RFP. Please refer to the SAWPA standard contractual agreement for more specific details regarding the typical SAWPA contractual obligations, bearing in mind that additional obligations may be inserted.

5.11 Right to Pertinent Materials

All responses, inquiries, and correspondence relating to this RFP and all reports, charts, displays, schedules, exhibits, and other documentation produced by a Bidder and submitted as part of the proposal shall become the property of SAWPA after the proposal submission deadline. The proposals will not be returned. If any proprietary information is contained in the proposal, it should be clearly identified.

5.12 Modifications to the RFP

SAWPA is interested in cost-effective solutions to providing quality aerial photography for members of the watershed agencies. Accordingly, SAWPA reserves the right to negotiate material aspects of the RFP, including, but not limited to: project approach, collection methodology, cost options, report format, product distribution (method & schedule), and period of coverage.

SAWPA may modify the RFP prior to the date fixed for submission of proposals by issuance of an addendum to all parties who have received the RFP. All addendums will be incorporated into the final RFP.

5.14 Prime Consultant

SAWPA will only accept multi-consultant solutions with the strict understanding that there must be a single entity identified which will act as the prime Consultant and assume legal and financial responsibility for all services provided.

5.15 Term

The term of an agreement (i.e. the Task Order attached in Exhibit C) awarded as a result of this RFP shall be from April 2021 through April 2022. The agreement may be extended on a month-to-month, quarterly, or annual basis by mutual agreement of Consultant and SAWPA.

5.16 Other Contract Provisions

See Exhibit C for the full terms. The Contract includes the General Services Agreement and the

Task Order. The Task Order includes language related to the invoicing by the selected Consultant.

ATTACHMENTS

Exhibit A –	**Price Proposal Tables for Bidders**
Exhibit B –	**Maps of AOIs (Also included as shapefiles in Exhibits D and E)**
Exhibit C –	**Sample SAWPA Consulting Agreement** Includes General Services Agreement and Task Order
Exhibit D -	**Shapefile: Imagery AOI for Upper Watershed Imagery; includes retail water agency boundaries**
Exhibit E -	**Shapefile: Elevation Deliverables AOI**

SAWPA 2021 EXHIBIT A Price Proposal Tables for Bidders

DATE:

BIDDER:

Table 1 - Imagery and Related Deliverables for Imagery AOI Shown in Exhibit D (does not include elevation deliverables)

Instructions: Bidders should fill in columns A through E. Additional rows can be used if bidder has various prices for products with different flight heights, flight date ranges, etc. Column D represents an AOI that covers a portion of the entire AOI shown in Exhibit D. The entire AOI in Exhibit E is about 2,000 square miles. For Column C, if more space is needed, the Bidder can provide addition text via the RFP proposal's question "i - Fee Narrative."

Columns:	A	B	C	D	E
Product & Services	Flight Height	Flight Date Range	Other Notes from Bidder	≤1,000 square miles of Imagery AOI	All of Imagery AOI
3" GSD Flight Products					
Additional rows for 3" GSD Products if needed					
6" GSD Flight Products					
Additional rows for 6" GSD Products if needed					
12" GSD Flight Products					
Additional rows for 12" GSD Products if needed					

Table 2 - Elevation Deliverables (See RFP Section 3.6 of the RFP)

Instructions: Bidder to provide a price per square mile in columns C through F. SAWPA assumes price will change depending on resolution, but bidder may enter same price if that reflects the prices bidder wants to provide. In column B, if the bidder has information related to the specific resolution such as what consititutes <1 Meter, please provide it in the column's cell.

Column:	A	B	C	D	E	F
			Resolution In Meters*			
	Square Mileage**	Other Notes from Bidder	Approximately 5	≤2	1	<1
Triangulated irregular network	< 50					
	50 - 250					
	250 - 500					
	> 500					

*Resolution of the bidder's elevation model used to develop the deliverables listed in Section 3.6 of the RFP

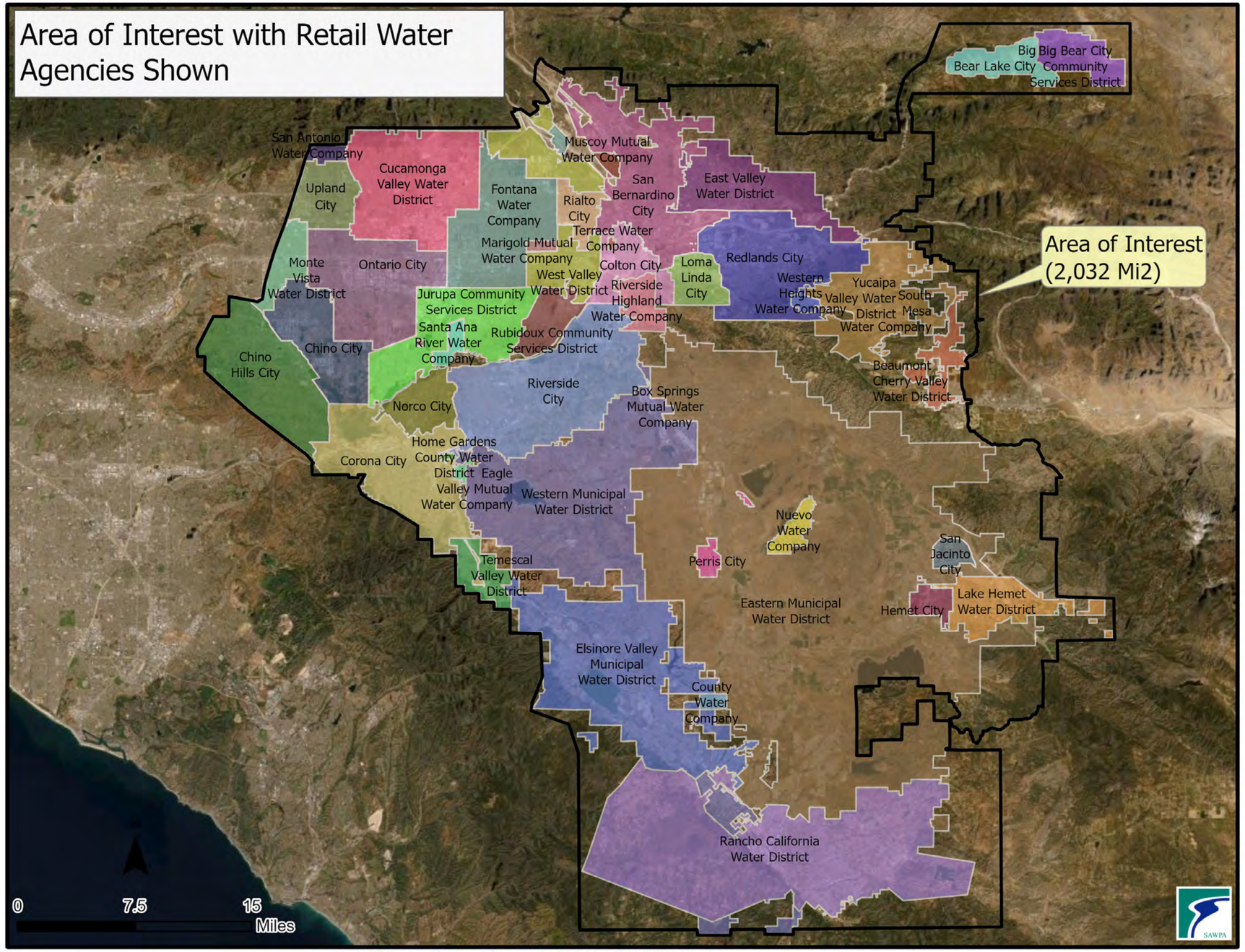
**The exact project areas have not yet been defined. In the yellow boxes provide a per mile cost for each of the total project area ranges for the deliverables discussed in Section 3.6 of the RFP.

Exhibit B

Maps of AOIs

Imagery AOI

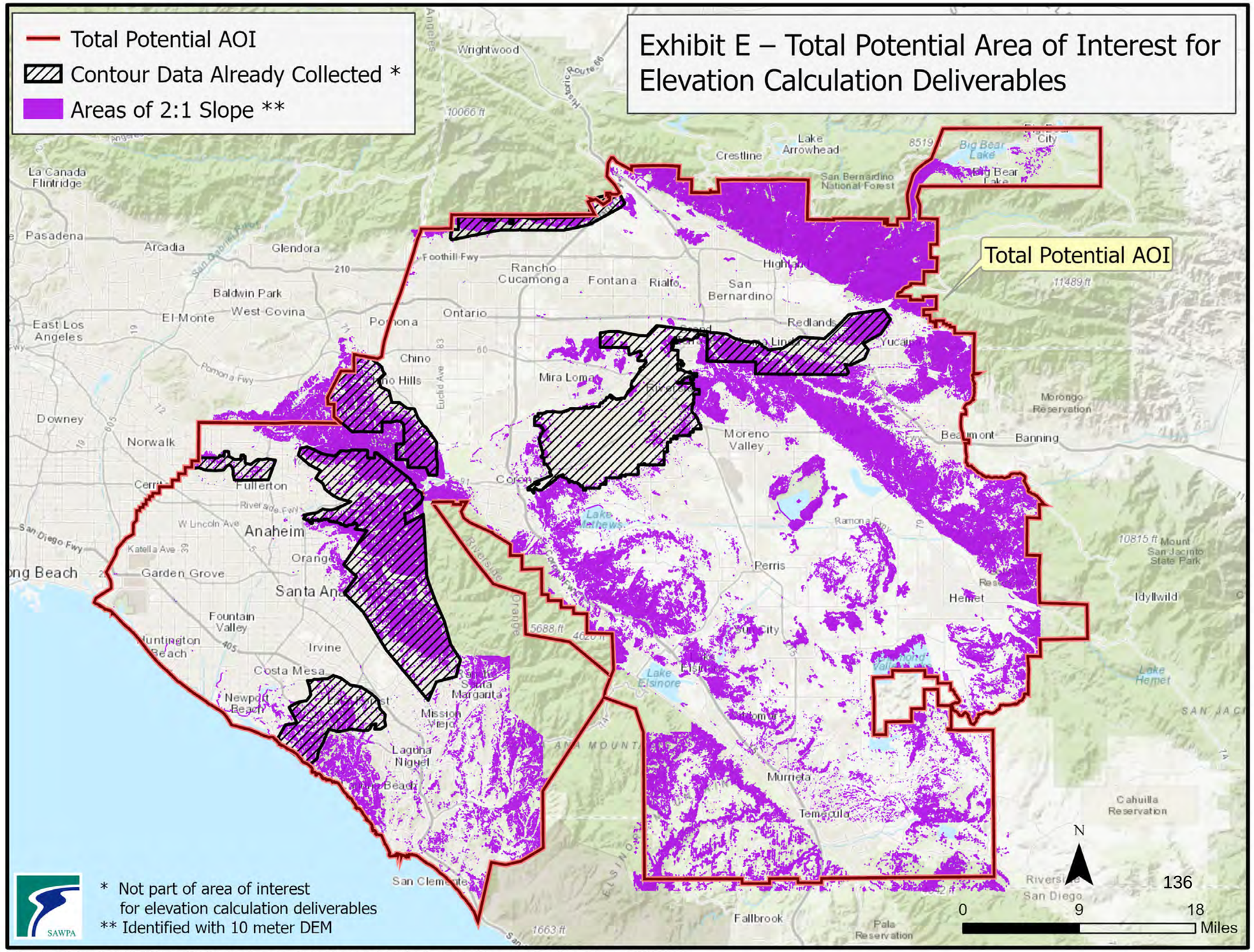
For Shapefiles see Exhibit D



P:\projects\Prop1SAWPA\UpperWatershedProposalMap\UpperWatershedProposalMap.aprx LoFlightPathUW SW-3014

Elevation AOI

For Shapefiles see Exhibit E



SANTA ANA WATERSHED PROJECT AUTHORITY
GENERAL SERVICES AGREEMENT FOR SERVICES BY INDEPENDENT CONSULTANT

This Agreement is made this ___ day of _____, **20**__ by and between the Santa Ana Watershed Project Authority ("SAWPA") located at 11615 Sterling Ave., Riverside, California, 92503 and _____ ("Consultant") whose address is _____.

RECITALS

This Agreement is entered into on the basis of the following facts, understandings, and intentions of the parties to this Agreement:

- SAWPA desires to engage the professional services of Consultant to perform such professional consulting services as may be assigned, from time to time, by SAWPA in writing;
- Consultant agrees to provide such services pursuant to, and in accordance with, the terms and conditions of this Agreement and has represented and warrants to SAWPA that Consultant possesses the necessary skills, qualifications, personnel, and equipment to provide such services; and
- The services to be performed by Consultant shall be specifically described in one or more written Task Orders issued by SAWPA to Consultant pursuant to this Agreement.

AGREEMENT

Now, therefore, in consideration of the foregoing Recitals and mutual covenants contained herein, SAWPA and Consultant agree to the following:

ARTICLE I
TERM OF AGREEMENT

1.01 This agreement shall become effective on the date first above written and shall continue until **December 31, 20**__, unless extended or sooner terminated as provided for herein.

ARTICLE II
SERVICES TO BE PERFORMED

2.01 Consultant agrees to provide such professional consulting services as may be assigned, from time to time, in writing by the Commission and the General Manager of SAWPA. Each assignment shall be made in the form of a written Task Order. Each such Task Order shall include, but shall not be limited to, a description of the nature and scope of the services to be performed by Consultant, the amount of compensation to be paid, and the expected time of completion.

2.02 Consultant may at Consultant's sole cost and expense, employ such competent and qualified independent professional associates, subcontractors, and consultants as Consultant deems necessary to perform each assignment; provided that Consultant shall not subcontract any work to be performed without the prior written consent of SAWPA.

ARTICLE III
COMPENSATION

3.01 In consideration for the services to be performed by Consultant, SAWPA agrees to pay Consultant as provided for in each Task Order.

3.02 Each Task Order shall specify a total not-to-exceed sum of money and shall be based upon the regular hourly rates customarily charged by Consultant to its clients.

3.03 Consultant shall not be compensated for any services rendered nor reimbursed for any expenses incurred in excess of those authorized in any Task Order unless approved in advance by the Commission and General Manager of SAWPA, in writing.

3.04 Unless otherwise provided for in any Task Order issued pursuant to this Agreement, payment of compensation earned shall be made in monthly installments after receipt from Consultant of a timely, detailed, corrected, written invoice by SAWPA's Project Manager, describing, without limitation, the services performed, when such services were performed, the time spent performing such services, the hourly rate charged therefore, and the identity of individuals performing such services for the benefit of SAWPA. Such invoices shall also include a detailed itemization of expenses incurred. Upon approval by an authorized SAWPA employee, SAWPA will pay within 30 days after receipt of a valid invoice from Consultant.

ARTICLE IV
CONSULTANT OBLIGATIONS

4.01 Consultant agrees to perform all assigned services in accordance with the terms and conditions of this Agreement including those specified in each Task Order. In performing the services required by this Agreement and any related Task Order Consultant shall comply with all local, state and federal laws, rules and regulations. Consultant shall also obtain and pay for any permits required for the services it performs under this Agreement and any related Task Order.

4.02 Except as otherwise provided for in each Task Order, Consultant will supply all personnel and equipment required to perform the assigned services.

4.03 Consultant shall be solely responsible for the health and safety of its employees, agents and subcontractors in performing the services assigned by SAWPA.

4.04 Insurance Coverage: Consultant shall procure and maintain for the duration of this Agreement insurance against claims for injuries or death to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Consultant, its agents, representatives, employees or sub-contractors.

4.04(a) **Coverage -** Coverage shall be at least as broad as the following:

1. **Commercial General Liability (CGL) -** Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including products and completed operations, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars ($2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to SAWPA) or the general aggregate limit shall be twice the required occurrence limit.

2. **Automobile Liability –** (if necessary) Insurance Services Office (ISO) Business Auto Coverage (Form CA 00 01), covering Symbol 1 (any auto) or if Consultant has no owned autos, Symbol 8 (hired) and 9 (non-owned) with limit of one million dollars ($1,000,000) for bodily injury and property damage each accident.

3. **Workers' Compensation Insurance -** as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than $1,000,000 per accident for bodily injury or disease.

4. **Professional Liability** - (Also known as Errors & Omission) Insurance appropriates to the Consultant profession, with limits no less than $1,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

5. **Cyber Liability Insurance (Technology Professional Liability – Errors and Omissions) –** If Consultant will be providing technology services, limits not less than $2,000,000 per occurrence or claim, and $2,000,000 aggregate or the full per occurrence limits of the policies available, whichever is greater. Coverage shall be sufficiently broad to respond to the duties and obligations as is undertaken by Consultant in this Agreement and shall include, but not be limited to, claims involving infringement of intellectual property, including but not limited to infringement of copyright, trademark, trade dress,

invasion of privacy violations, information theft, damage to or destruction of electronic information, release of private information, alteration of electronic information, extortion and network security. The policy shall provide coverage for breach response costs as well as regulatory fines and penalties as well as credit monitoring expenses with limits sufficient to respond to these obligations.

If the Consultant maintains broader coverage and/or higher limits than the minimums shown above, SAWPA requires and shall be entitled to the broader coverage and/or higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to SAWPA.

4.04(b) If Claims Made Policies:

1. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.
2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.
3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Consultant must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

4.04(c) Waiver of Subrogation: The insurer(s) named above agree to waive all rights of subrogation against SAWPA, its elected or appointed officers, officials, agents, authorized volunteers and employees for losses paid under the terms of this policy which arise from work performed by the Named Insured for the Agency; but this provision applies regardless of whether or not SAWPA has received a waiver of subrogation from the insurer.

4.04(d) **Other Required Provisions -** The general liability policy must contain, or be endorsed to contain, the following provisions:

1. **Additional Insured Status:** SAWPA, its directors, officers, employees, and authorized volunteers are to be given insured status (at least as broad as ISO Form CG 20 10 10 01), with respect to liability arising out of work or operations performed by or on behalf of the Consultant including materials, parts, or equipment furnished in connection with such work or operations.

2. **Primary Coverage:** For any claims related to this project, the Consultant's insurance coverage shall be primary at least as broad as ISO CG 20 01 04 13 as respects to SAWPA, its directors, officers, employees and authorized volunteers. Any insurance or self-insurance maintained by the Member Water Agency its directors, officers, employees and authorized volunteers shall be excess of the Consultant's insurance and shall not contribute with it.

4.04(e) **Notice of Cancellation:** Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to SAWPA.

4.04(f) Self-Insured Retentions - Self-insured retentions must be declared to and approved by SAWPA. SAWPA may require the Consultant to provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or SAWPA.

4.04(g) Acceptability of Insurers - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A: VII or as otherwise approved by SAWPA.

4.04(h) Verification of Coverage – Consultant shall furnish SAWPA with certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause. All certificates and endorsements are to be received and approved by SAWPA before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Consultant's obligation to provide them. SAWPA reserves the right to require complete, certified copies of all required insurance policies, including policy Declaration pages and Endorsement pages.

4.04(i) **Subcontractors -** Consultant shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Consultant shall ensure that SAWPA, its directors, officers, employees and authorized volunteers are additional insureds on Commercial General Liability Coverage.

4.05 Consultant hereby covenants and agrees that SAWPA, its officers, employees, and agents shall not be liable for any claims, liabilities, penalties, fines or any damage to property, whether real or personal, nor for any personal injury or death caused by, or resulting from, or claimed to have been caused by or resulting from, any negligence, recklessness, or willful misconduct of Consultant. To the extent permitted by law, Consultant shall hold harmless, defend at its own expense, and indemnify SAWPA, its directors, officers, employees, and authorized volunteers, against any and all liability, claims, losses, damages, or expenses, including reasonable attorney's fees and costs, arising from all acts or omissions of Consultant or its officers, agents, or employees in rendering services under this Agreement and any Task Order issued hereunder; excluding, however, such liability, claims, losses, damages or expenses arising from SAWPA's sole negligence or willful acts.

4.06 In the event that SAWPA requests that specific employees or agents of Consultant supervise or otherwise perform the services specified in each Task Order, Consultant shall ensure that such individual(s) shall be appointed and assigned the responsibility of performing the services.

4.07 In the event Consultant is required to prepare plans, drawings, specifications and/or estimates, the same shall be furnished with a registered professional engineer's number and shall conform to local, state and federal laws, rules and regulations. Consultant shall obtain all necessary permits and approvals in connection with this Agreement, any Task Order or Change Order. However, in the event SAWPA is required to obtain such an approval or permit from another governmental entity, Consultant shall provide all necessary supporting documents to be filed with such entity, and shall facilitate the acquisition of such approval or permit.

4.08 Consultant shall comply with all local, state and federal laws, rules and regulations including those regarding nondiscrimination and the payment of prevailing wages, if required by law.

ARTICLE V
SAWPA OBLIGATIONS

5.01 SAWPA shall:

5.01a Furnish all existing studies, reports and other available data pertinent to each Task Order that are in SAWPA's possession;

5.01b Designate a person to act as liaison between Consultant and the General Manager and Commission of SAWPA.

ARTICLE VI
ADDITIONAL SERVICES, CHANGES AND DELETIONS

6.01 During the term of this Agreement, the Commission of SAWPA may, from time to time and without affecting the validity of this Agreement or any Task Order issued pursuant thereto, order changes, deletions, and additional services by the issuance of written Change Orders authorized and approved by the Commission of SAWPA.

6.02 In the event Consultant performs additional or different services than those described in any Task Order or authorized Change Order without the prior written approval of the Commission of SAWPA, Consultant shall not be compensated for such services.

6.03 Consultant shall promptly advise SAWPA as soon as reasonably practicable upon gaining knowledge of a condition, event, or accumulation of events, which may affect the scope and/or cost of services to be provided pursuant to this Agreement. All proposed changes, modifications, deletions, and/or requests for additional services shall be reduced to writing for review and approval or rejection by the Commission of SAWPA.

6.04 In the event that SAWPA orders services deleted or reduced, compensation shall be deleted or reduced by a comparable amount as determined by SAWPA and Consultant shall only be compensated for services actually performed. In the event additional services are properly authorized, payment for the same shall be made as provided in Article III above.

ARTICLE VII
CONSTRUCTION PROJECTS: CONSULTANT CHANGE ORDERS

7.01 In the event SAWPA authorizes Consultant to perform construction management services for SAWPA, Consultant may determine, in the course of providing such services, that a Change Order should be issued to the construction contractor, or Consultant may receive a request for a Change Order from the construction contractor. Consultant shall, upon receipt of any requested Change Order or upon gaining knowledge of any condition, event, or accumulation of events, which may necessitate issuing a Change Order to the construction contractor, promptly consult with the liaison, General Manager and Commission of SAWPA. No Change Order shall be issued or executed without the prior approval of the Commission of SAWPA.

ARTICLE VIII
TERMINATION OF AGREEMENT

8.01 In the event the time specified for completion of an assigned task in a Task Order exceeds the term of this Agreement, the term of this Agreement shall be automatically extended for such additional time as is necessary to complete such Task Order and thereupon this Agreement shall automatically terminate without further notice.

8.02 Notwithstanding any other provision of this Agreement, SAWPA, at its sole option, may terminate this Agreement at any time by giving 10 day written notice to Consultant, whether or not a Task Order has been issued to Consultant.

8.03 In the event of termination, the payment of monies due Consultant for work performed prior to the effective date of such termination shall be paid after receipt of an invoice as provided in this Agreement.

ARTICLE IX
CONSULTANT STATUS

9.01 Consultant shall perform the services assigned by SAWPA in Consultant's own way as an independent contractor, in pursuit of Consultant's independent calling and not as an employee of SAWPA. Consultant shall be under the control of SAWPA only as to the result to be accomplished and the personnel assigned to perform services. However, Consultant shall regularly confer with SAWPA's liaison, General Manager, and Commission as provided for in this Agreement.

9.02 Consultant hereby specifically represents and warrants to SAWPA that the services to be rendered pursuant to this Agreement shall be performed in accordance with the standards customarily applicable to an experienced and competent professional consulting organization rendering the same or similar services. Furthermore, Consultant represents and warrants that the individual signing this Agreement on behalf of Consultant has the full authority to bind Consultant to this Agreement.

ARTICLE X
AUDIT AND OWNERSHIP OF DOCUMENTS

10.01 All draft and final reports, plans, drawings, specifications, data, notes, and all other documents of any kind or nature prepared or developed by Consultant in connection with the performance of services assigned to it by SAWPA are the sole property of SAWPA, and Consultant shall promptly deliver all such materials to SAWPA. Consultant may retain copies of the original documents, at its option and expense. Use of such documents by SAWPA for project(s) not the subject of this Agreement shall be at SAWPA's sole risk without legal liability or exposure to Consultant. SAWPA agrees to not release any software "code" without prior written approval from the Consultant.

10.02 Consultant shall retain and maintain, for a period not less than four years following termination of this Agreement, all time records, accounting records, and vouchers and all other records with respect to all matters concerning services performed, compensation paid and expenses reimbursed. At any time during normal business hours and as often as SAWPA may deem necessary, Consultant shall make available to SAWPA's agents for examination of all such records and will permit SAWPA's agents to audit, examine and reproduce such records.

ARTICLE XI
MISCELLANEOUS PROVISIONS

11.01 This Agreement supersedes any and all previous agreements, either oral or written, between the parties hereto with respect to the rendering of services by Consultant for SAWPA and contains all of the covenants and agreements between the parties with respect to the rendering of such services in any manner whatsoever. Any modification of this Agreement will be effective only if it is in writing signed by both parties.

11.02 Consultant shall not assign or otherwise transfer any rights or interest in this Agreement without the prior written consent of SAWPA. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this Agreement.

11.03 In the event Consultant is an individual person and dies prior to completion of this Agreement or any Task Order issued hereunder, any monies earned that may be due Consultant from SAWPA as of the date of death will be paid to Consultant's estate.

11.04 Time is of the essence in the performance of services required hereunder. Extensions of time within which to perform services may be granted by SAWPA if requested by Consultant and agreed to in writing by SAWPA. All such requests must be documented and substantiated and will only be granted as the result of unforeseeable and unavoidable delays not caused by the lack of foresight on the part of Consultant.

11.05 SAWPA expects that Consultant will devote its full energies, interest, abilities and productive time to the performance of its duties and obligations under this Agreement, and shall not engage in any other consulting activity that would interfere with the performance of Consultant's duties under this Agreement or create any conflicts of interest. If required by law, Consultant shall file a Conflict of Interest Statement with SAWPA.

11.06 Any dispute which may arise by and between SAWPA and the Consultant, including the Consultants, its employees, agents and subcontractors, shall be submitted to binding arbitration. Arbitration shall be conducted by a neutral, impartial arbitration service that the parties mutually agree upon, in accordance with its rules and procedures. The arbitrator must decide each and every dispute in accordance with the laws of the State of California, and all other applicable laws. Unless the parties stipulate to the contrary prior to the appointment of the arbitrator, all disputes shall first be submitted to non-binding mediation conducted by a neutral, impartial mediation service that the parties mutually agree upon, in accordance with its rules and procedures.

11.07 During the performance of the Agreement, Consultant and its subcontractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status and denial of family care leave. Consultant and its subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Consultant and its subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code, Section 12290 et seq.) and the applicable regulations promulgated there under (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 et seq., set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part hereof as if set forth in full. Consultant and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. Consultant shall include the

non-discrimination and compliance provisions of this clause in all subcontracts to perform work under the Agreement.

11.08 Contractor's employees, agents and subcontractors shall adhere to, and comply with, the California Drug Free Workplace Act at Government Code, Sections 8350 through 8357.

In witness whereof, the parties hereby have made and executed this Agreement as of the day and year first above-written.

SANTA ANA WATERSHED PROJECT AUTHORITY

_____

Richard E. Haller, P.E., General Manager Date

(CONSULTANT NAME)

_____ _____

(Signature) Date Typed/Printed Name

SANTA ANA WATERSHED PROJECT AUTHORITY
TASK ORDER NO. _____

CONSULTANT: [Name] **VENDOR NO.:**XXX
[Address]

COST: **$xxxx**

PAYMENT: Upon Receipt of Proper Invoice

REQUESTED BY: [Manager], [Title] [Date]

FINANCE: _____
Karen Williams, Deputy GM/CFO Date

FINANCING SOURCE: Acct. Coding xx
Acct. Description xx

COMMISSION AUTHORIZATION REQUIRED FOR THIS TASK ORDER: YES ( ) NO ( )
Authorization: [Date]; CM#2021.xx

This Task Order is issued upon approval and acceptance by the Santa Ana Watershed Project Authority (SAWPA) and _____ **(Consultant)** pursuant to the General Agreement for Services between SAWPA and Consultant, entered into on **[date],** expiring **[date].**

I. PROJECT NAME OR DESCRIPTION
Imagery Acquisition 2021

II. SCOPE OF WORK / TASKS TO BE PERFORMED
Consultant shall provide all labor, materials, and equipment for the services to implement the Project scope of work.

[Scope of work included in RFP]

III. PERFORMANCE TIME FRAME
Consultant shall begin work **[date]** and shall complete performance of such services by **[date].**

IV. SAWPA LIAISON
Ian Achimore shall serve as liaison between SAWPA and Consultant

V. COMPENSATION
For all services rendered by Consultant pursuant to this Task Order, Consultant shall receive a not-to-exceed sum of **$**_____. Funding for the services, provided by the State through a reimbursable grant with SAWPA, will be provided to the Consultant when SAWPA is provided payment by the State after the calendar year's quarter. Each invoice from the Consultant shall be provided to SAWPA within 15 days after the end of the calendar year's quarter in which the services were performed. The Consultant's invoice will bill for the Project per the Fee Table attached [Exhibit A in RFP] for the portion of work that was completed in the past calendar year quarter. Note that a retention withholding of 10% will be withheld on each quarterly invoice.

VI. CONTRACT DOCUMENTS PRECEDENCE

In the event of a conflict in terms between and among the contract documents herein, the document item highest in precedence shall control. The precedence shall be:

A. The Agreement for Services by Independent Consultant/Contractor.
B. The Task Order or Orders issued pursuant to the Agreement, in numerical order.
C. Exhibits attached to each Task Order, which may describe, among other things, the Scope of Work and compensation therefore.
D. Fee tables.
E. Specifications incorporated by reference.
F. Drawings incorporated by reference.

In witness whereof, the parties have executed this Task Order on the date indicated below.

SANTA ANA WATERSHED PROJECT AUTHORITY

Richard E. Haller, P.E., General Manager Date

[CONSULTANTS NAME]

(Signature) Date Print/Type Name and Title