CGA/GGA Joint Technical Advisory Committee Meeting
Meeting Packet

July 8, 2022

CGA/GGA Joint Technical Advisory Committee Meeting

Meeting Agenda

July 8, 2022 | 1:00 p.m.

In Person Meeting Locations:

Colusa County Courthouse
547 Market Street, Suite 102
Colusa, CA 95932

Glenn County Planning and Community Development Services Agency
225 North Tehama Street
Willows, CA 95988

Meeting locations will be joined via Zoom, public input is welcome in person or via Zoom

Join Zoom Meeting
https://countyofcolusa.zoom.us/j/6707238820?pwd=NjFMcnJOUENuSFhtRFFtaWltejYzZz09

Meeting ID: 670 723 8820
Passcode: 004212
One tap mobile
+16694449171,,6707238820#,,,,*004212# US
+16699006833,,6707238820#,,,,*004212# US (San Jose)

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* Indicates an Action Item

1. **Call to Order, Roll Call, and Introductions**

2. **Approval of Minutes (CGA TAC, GGA TAC)**
   a. ***March 11, 2022 CGA/GGA Joint TAC Meeting Minutes**
   b. ***** **May 13, 2022 CGA/GGA Joint TAC Meeting Minutes**

3. **Period of Public Comment**
   At this time, members of the public may address the Technical Advisory Committee (TAC) Members regarding items that are not on the agenda but are of relevance. The TACs may not act on items not on the agenda.

4. ***Joint TAC Meeting Schedule for Remainder of 2022**

5. **Subsidence Benchmark Update**

6. **Hydrogeologic Investigation Update**

7. **Well Monitoring Pilot Project Update**

9. **Discussion of 2022/2023 Grant Application**

10. **Drought Update**

11. **Member Reports and Comments**

12. **Next meeting: Pending outcome of Item 9**

13. **Adjourn**

A complete agenda packet, including back-up information, is available for inspection during normal business hours at 1213 Market Street, Colusa, CA 95932 or 225 N. Tehama St., Willows, CA 95988. The full agenda packet can also be found on the CGA and GGA websites: Agendas and Minutes 2022 | Colusa Groundwater Authority (CGA)
https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/glenn-groundwater-authority/gga
In compliance with the Americans with Disability Act, if you require special accommodation to participate in this meeting, please contact the Colusa County Water Resources Division at 530-458-0891 or Glenn County Water Resources Division at 530-934-6540 prior to any meeting and arrangements will be made to accommodate you.

Staff Report

To: CGA-GGA Joint TAC

Agenda Item: 2. Approval of Minutes

Date: July 8, 2022

Background

The March 11, 2022 and May 13, 2022 CGA/GGA Joint TAC Meeting minutes have been prepared for review.

Recommendation

Approve the March 11, 2022 and May 13, 2022 CGA/GGA Joint TAC Meeting minutes.

Attachments

- March 11, 2022 CGA/GGA Joint TAC Meeting minutes
- May 13, 2022 CGA/GGA Joint TAC Meeting minutes

CGA/GGA Joint Technical Advisory Committee Meeting

MEETING MINUTES
March 11, 2022 | 1:00 p.m.

Due to safety concerns and directives from the Governor and Federal Government related to COVID-19,
This meeting was held remotely ONLY.

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1. Call to Order, Roll Call, and Introductions
The meeting was called to order at approximately 1:03 p.m.

In Attendance:
Committee Members:
GGA: Emil Cavagnolo, Zac Dickens, Leslie Nerli, Don Bills, Mark Lohse.
CGA: Denise Carter, Jim Wallace, Bill Vanderwaal, Deke Dormer, Ben King, Brandon Davison (DWR, ex-officio)

A quorum of both member groups was present.

Others in Attendance: Lisa Hunter (GGA Staff), Grant Davids (Davids Engineering, Inc.), Jim Brobeck, Katie Klug (Davids Engineering), Ken Loy (West Yost), Jeff Davids (Davids Engineering), Anna Reimer (West Yost), Luis Mendoza (Glenn County), Arne Gustafson, Ritta Martin, Joe Turner, Shelly Murphy (CGA), Jaime Lely.

2. Approval of Minutes (CGA TAC, GGA TAC)
a. *August 13, 2021 CGA/GGA Joint TAC Meeting

CGA: Committee Member Bill Vanderwaal moved to approve the minutes from the August 13, 2021 CGA/GGA Joint TAC Meeting. Member Deke Dormer seconded and the motion passed per roll call vote.
Ben King- Aye
Bill Vanderwaal- Aye
Deke Dormer- Aye
Jim Wallace - Aye

GGA: Committee Member Don Bills moved to approve the minutes from the August 13, 2021 CGA/GGA Joint TAC Meeting. Member Emil Cavagnolo seconded and the motion passed per the following roll call vote:
Don Bills- Aye
Emil Cavagnolo- Aye
Mark Lohse- Aye
Zac Dickens – Aye
Leslie Nerli- no audio during vote

3. Period of Public Comment

No public comment was heard.

4. Presentation: Review of Sustainable Management Criteria in Colusa Subbasin Groundwater Sustainability Plan

List of Acronyms:
CEQA – California Environmental Quality Act
GDE - Groundwater Dependent Ecosystems
GSA – Groundwater Sustainability Agency
GSP – Groundwater Sustainability Plan
MO – Measurable Objective
MT – Minimum Threshold
PMAs – Projects and Management Actions
PPT – Powerpoint Presentation
SGMA – Sustainable Groundwater Management Act
SMC – Sustainable Management Criteria
TAC – Technical Advisory Committee
UR – Undesirable Result

Grant Davids of consulting firm Davids Engineering provided an overview of agenda presentation items 4 and 5. Mr. Davids introduced Ken Loy of West Yost who gave a presentation on the sustainability management criteria included in the final Colusa Subbasin GSP.

Proceedings/Discussion:
Ben King asked for clarification on the statement that the final GSP is more protective, whereby Mr. Loy explained that the City of Orland was concerned about the minimum thresholds being too low and that the final GSP has raised those thresholds to address that concern.

Mr. King also asked if all three stages are being monitored on the multi-completion wells, whereby Mr. Loy confirmed they were.

Leslie Nerli stated the new municipal well being built in the City of Orland would be an appropriate well monitoring site.

Jim Wallace asked if the technical team has been monitoring each individual well and comparing the data to the MT's and Annual Report, whereby Mr. Grant Davids stated that information would be presented later in the meeting.

5. Presentation: Colusa Subbasin Groundwater Sustainability Plan Annual Report

Mr. Loy turned the presentation over to Katie Klug of Davids Engineering, who reviewed the GSP Annual Report and overview of groundwater conditions and water supply through Water Year 2021.

Ms. Klug turned the presentation over to Anna Reimer of West Yost who reviewed groundwater conditions and measured land subsidence for the subbasin. Grant and Jeff Davids (Davids Engineering) answered various questions on different slides throughout the presentation related to groundwater storage calculations and the annual and cumulative changes in groundwater storage.

The presentation was then handed back to Ms. Klug to present information on water supply and water use, in addition to water use sectors, projects and management actions updates, the well monitoring pilot project, and data related to groundwater extraction. Ms. Klug invited comments and questions from the presentation, and encouraged members to suggest any additional information that should be available in the Annual Report.

Proceedings/Discussion:

Mr. King asked if there is a separate measure for critical infrastructure in relation to subsidence; whereby, Mr. Loy stated there is not. Mr. King also asked what the role of the TAC is in reporting out the subsidence information and engaging the respective Boards; whereby, Mr. Loy referred Mr. King to Chapter 7 of the GSP Implementation section for guidance. Ms. Hunter stated there is a lot of coordination expected between the respective boards and TACs as the TACs report out to their respective Boards.

Mr. King asked if the reported deliveries that go out of the basin from the Tehama-Colusa Canal are included in the information presented, whereby Ms. Klug stated the information is based on contractors from each of the respective service areas and includes upstream and downstream deliveries.

Jim Brobeck asked if the reports of sinkholes are reflected in the subsidence readings; whereby, Mr. Loy stated the phenomenon may be related but the subsidence measurement is a different metric and reviewed the recent sightings and reports of sinkholes in the area.

Jim Brobeck asked if data would be gathered from the irrigation districts for groundwater extraction in regards to the expansion of groundwater infrastructure; whereby, Ms. Klug said data availability is sparse and does not have information related to that.

Jim Wallace asked how many applications were received for the well monitoring pilot program and what the expected cost is per site; whereby, Ms. Klug stated the cost per site is approximately $9,000-$10,000, and Ms. Hunter stated the project is still expanding as a Round 2 solicitation just ended and staff also reached out to sites that were not selected the first round to gauge interest to be included in the program. Approximately sixteen sites have indicated interest in the program.

Jim Brobeck asked how the wells are characterized as well as the well depths for each well in the well monitoring pilot program to ensure the sites are appropriate, whereby Mr. Grant Davids stated the program is less focused on collecting scientific data and more focused on determining the cost for monitoring groundwater production. Mr. Loy further stated that each of the Representative Monitoring Network wells in the program do have screen levels and the data Mr. Brobeck asked for included in the GSP.

Lisa Hunter stated the presentation and related materials would be available online shortly.

6. ***Approve 2022 CGA/GGA Meeting Schedule**

Ms. Hunter introduced the item and noted that the CGA TAC no longer has a quorum. Ms. Hunter suggested the group discuss what the anticipated workload for the committee would be and how often the group would need to meet or table the item to a later meeting.

Mr. Bills asked how the meeting schedule corresponds to the short time frame in between state mandated deadlines, whereby Ms. Hunter stated documents should be available as needed for review prior to the meetings.

Mr. King suggested conducting meetings on another week day besides Friday, as well as combining the two TACs into one body so as to increase the chances of having a quorum. Mr. King also spoke to the need to have data and reports available for review sooner, whereby Mr. Grant Davids stated going forward the reports should be expected sooner but the GSP regulations have made the deadlines very tight. Discussion ensued.

Ms. Hunter noted that soon there will not be consultants involved as much in the meetings going forward.

7. **Member Reports and Comments**

Ben King asked for a status update on the new well ordinance expected in Glenn County; whereby, Ms. Hunter stated the County is currently working on a draft ordinance and soliciting commentary from various agencies. Mr. King also asked if there is a comment period and if the County plans on collaborating with Colusa County; whereby, Ms. Hunter stated Glenn County has been reviewing what other counties are currently doing and though there is no formal comment period, they are still accepting feedback.

8. **Adjourn**

The meeting was adjourned at 3:41 p.m.

CGA/GGA Joint Technical Advisory Committee Meeting

MEETING MINUTES
May 13, 2022 | 1:00 p.m.

In Person Meeting Locations:

Colusa County, Market Street, Suite 102, Colusa, CA 95932

Glenn County, 225 N. Tehama St., Willows, CA 95988

The meeting was also held remotely via Zoom.

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1. Call to Order, Roll Call, and Introductions

Denise Carter called the meeting to order at approximately 1:00 p.m.

In Attendance:
Committee Members:
GGA: Zac Dickens, Matt Deadmond, and Mark Lohse. Emil Cavagnolo and Don Bills attended remotely as members of the public and did not count toward a quorum or vote.

CGA: Denise Carter, Darrin Williams, and Ben King. Jim Wallace and Brandon Davison (DWR, ex-officio) attended remotely as members of the public and did not count toward a quorum or vote.

A quorum of both member groups was not present.

Others in Attendance: Lisa Hunter (GGA Staff), Grant Davids (Davids Engineering, Inc.), Katie Klug (Davids Engineering), Ken Loy (West Yost), Anna Reimer (West Yost), Holly Dawley (GCID), Arne Gustafson, Greg Plucker (Colusa County), Jaime Lely, Anjanette Shadley (Western Canal Water District), Tiffanee Hutton, Ashley Driver (landowner), Michael Bolzowski (Cal Water), Richard (last name unknown)

2. Approval of Minutes (CGA TAC, GGA TAC)

a. ***March 11, 2022 CGA/GGA Joint TAC Meeting**

A quorum of CGA TAC members was not present. A quorum of GGA TAC members was not present. The item was tabled for a future meeting.

3. Period of Public Comment

No public comment was heard.

4. Subsidence Benchmark Update

Ken Loy of West Yost gave a presentation on existing land subsidence benchmarks and proposed new benchmark location areas for the Colusa Subbasin.

Proceedings/Discussion:

Mr. Loy reviewed a map of the subbasin illustrating each of the land subsidence benchmarks and measurement data for the Subbasin, noting that additional surveys need to be conducted of the area.

Ms. Carter asked how often the benchmark surveys are done, whereby Mr. Loy stated there is no specific guideline for how often, but the InSAR data is conducted monthly. Ben King asked how long the InSAR data has been collected for, whereby Anna Reimer of West Yost stated since June of 2015.

Donald Bills provided observations of certain areas of the map, encouraging the additional benchmark sites be around the Orland-Artois area. Mr. Bills asked if there have been any physical manifestations of subsidence, whereby Mr. Loy stated the consultant team is unable to positively identify if potholes, canal breaks, etc. are a direct result of subsidence. Discussion ensued on earth fissuring and its relation to subsidence. Mr. King commented on sink holes and their relation to subsidence.

Mr. Loy offered a quick tutorial on the causes of land subsidence, whereby the committee agreed and Mr. Loy reviewed the geologic environmental characteristics about the basis and the potential and direct causes of land subsidence for the area.

Mr. Loy stated there is $68,000 in funding to install new benchmarks and include those benchmarks in future surveys. He went on to focus on the Glenn County area of the subsidence map, and reviewed the recommended sites specific to Glenn County. Discussion ensued regarding potential sites and the data that was used for the site placement recommendations.

Mr. Loy invited comments on the potential site areas discussed and Mr. Dickens asked if the surveying would be done by Davids Engineering or subcontracted, whereby Mr. Loy stated the grant funding is provided to Davids Engineering; West Yost is subcontracted through this agreement and West Yost will be subcontracting with Jim Frame for surveying and reviewed the surveying process. Mr. Dickens asked what the level of coordination would be with DWR, whereby Brandon Davison and Mr. Loy explained the communication and the coordination that would occur with the DWR surveyor.

Ms. Carter asked the committee to contact herself or Lisa Hunter if they would like to provide local assistance for this project, whereby Mr. King stated he would be interested.

Mr. Loy reviewed the sites recommended for additional benchmarks in the Colusa County area. Discussion ensued on the viability of the sites. Ashley Driver encouraged the committee to also consider municipal wells in the Grimes area. Richard (last name unknown) asked if data from GPS units has been considered, whereby Mr. Loy stated the new sites will utilize GPS data.

5. Hydrogeologic Investigation Update

Mr. Loy provided a presentation on the hydrogeologic investigation work plan with a deadline for the end of June.

Proceedings/Discussion:

Mr. Loy stated the plan will be directed from the GSP and reviewed the outline of the workplan. Mr. Loy reviewed each of the hydrogeologic investigation tasks to be completed.

Mr. King provided commentary and suggestions related to the tasks. Discussion ensued.

6. Well Monitoring Pilot Project Update

Katie Klug of Davids Engineering gave a presentation on phase one and phase two for the Well Monitoring Pilot Program, stating this is a voluntary, non-regulatory program and reviewed the program background and goals.

Proceedings/Discussion:

Ms. Klug stated twelve sites are being considered for enrollment in the Program and staff has reached out to landowners that have expressed interest in participating.

Mr. Bills asked if the counties or other agencies are being notified of the program to increase interest in the program, whereby Ms. Klug stated there is a level of collaboration but no specific contacts. Discussion ensued surrounding the identified sites and the solicitation process.

7. 2023 SGMA Grant Funding Schedule

Lisa Hunter reviewed the 2023 SGMA grant funding schedule, stating the purpose of the item is to highlight potential grant funding, noting that staff is focusing on the second round of funding to open in September 2022. She emphasized only one application per basin is allowed. Mr. Davison noted this funding is available through Proposition 68, also noting award approval will occur mid next year. Mr. Davison encouraged each respective agency to have projects in mind and as ready as possible for when the funding become available. Ms. Carter noted technical assistance for putting together the potential projects may be needed, and each agency's respective TAC should discuss highest priority projects and then discuss jointly at next meeting. Mr. King encouraged the committee to research further funding and consider the allocation of that funding.

8. Member Reports and Comments

Mr. King noted research he has been conducting of historical documents in relation to the watershed before Reclamation District 108 was formed.

9. Next Meeting: July 8, 2022

The meeting was adjourned at 3:00 p.m.

Staff Report

To: CGA-GGA Joint TAC

Agenda Item: 4. Joint TAC Meeting Schedule for Remainder of 2022

Date: July 8, 2022

Background

The 2022 meeting schedule was discussed at the March 11, 2022 meeting. Based on comments received at that meeting, and the anticipated work to be completed in connection with preparing for the upcoming grant application, staff has prepared the following meeting schedule for the TACs' consideration:

- August 12, 2022
- September 9, 2022
- October 14, 2022
- No meeting in November 2022
- No meeting in December 2022

Additional meetings can be called if necessary, or meetings could be cancelled if they are not needed.

Recommendation

Approve the meeting schedule for the remainder of 2022.

Attachments

- None

Staff Report

To: CGA-GGA Joint TAC

Agenda Item: 5. Subsidence Benchmark Update;

6. Hydrogeologic Investigation Update;

7. Well Monitoring Pilot Project Update

Date: July 8, 2022

Background

The GSP planning grants have supported work to install additional subsidence benchmarks, develop a hydrogeologic investigation work plan, and develop and implement a Well Monitoring Pilot Project.

The Colusa Subbasin Supplemental Bench Marks Project Report and the Colusa Subbasin Well Monitoring Pilot Program Technical Memorandum have been submitted to the CGA and GGA and are attached.

The consultant team and staff will provide updates on these three tasks.

Recommendation

No action necessary. Updates only.

Attachments

- Colusa Subbasin Supplemental Bench Marks Project Report (June, 2022)
- Colusa Subbasin Well Monitoring Pilot Program Report Technical Memorandum (6/30/22)

FRAME SURVEYING & MAPPING
609 A Street Davis, CA 95616
530.756.8584 framesurveying.com

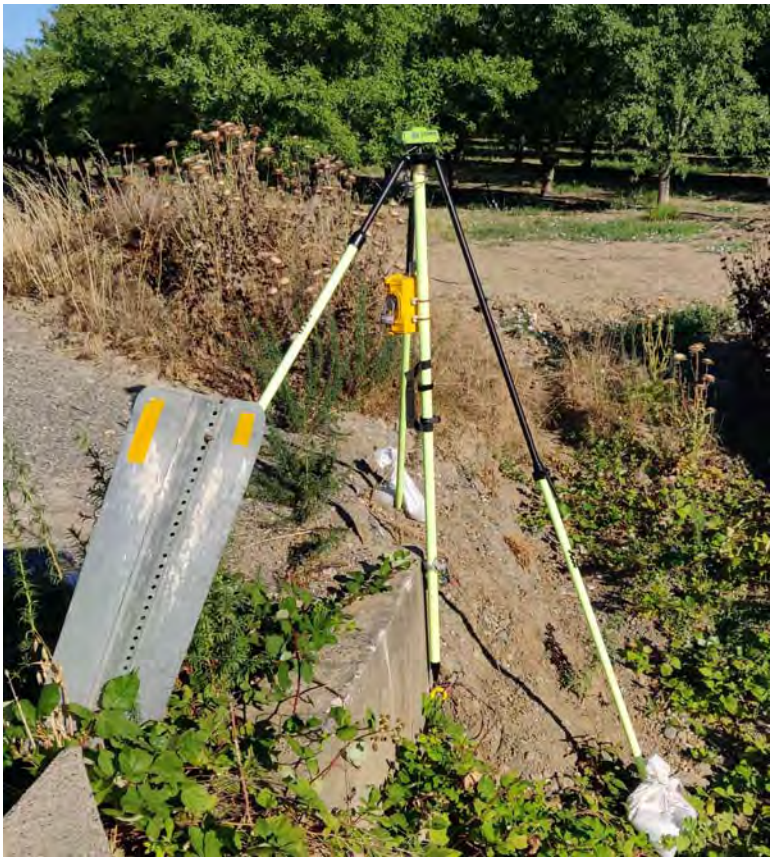
Project Report

Colusa Subbasin Supplemental Bench Marks
June, 2022

Project Purpose

The purpose of this project was to install 12 new bench marks in the Colusa Subbasin, and to establish NAD83 ellipsoid heights for each in support of ongoing land subsidence monitoring. The general locations for the new bench marks were identified by the Colusa Subbasin Groundwater Sustainability Plan Technical Advisory Committee (TAC) in May of 2022. Five of the Areas of Interest (AOIs) are in Glenn County, and seven are in Colusa County. (See Appendix A, Areas of Interest.)

Static GPS receiver at H62U



RTK base receiver at 5B35

LICENSED LAND SURVEYOR
JAMES H. FRAME III
No. 5435
STATE OF CALIFORNIA

Bench Mark Reconnaissance and Installation

Each of the 12 AOIs was visited in order to identify sites for new bench mark installations. Large concrete structures were selected to receive the new bench marks. All but 2 of the new marks consist of a 1" diameter copper disk drilled flush with the concrete surface of a structure.

In the case of AOI 4, a welded steel D was drilled and grouted into the lower face of a concrete wingwall. This mark format was chosen because the location was identified for use with an unattended GPS base receiver, and the wingwall configuration is such that a mark installed in the top of the wall would not permit all 3 legs of the base tripod to be solidly anchored. In addition, a fitting was needed to which the receiver setup can be locked in order to deter equipment theft, and the steel D provides that function. (See Appendix B, New Bench Mark Descriptions, for details.)

In the case of AOI 12, an existing bronze disk was found in a concrete bridge deck in a suitable location, so a new mark was not required there.

Each of the 12 AOI bench marks is identified by a unique 4-character designation generally derived from its geographic location. The 4-character identifiers are as follows:

AOI	4-Char ID	Approximate Location
Glenn County		
1	TRJN	Orland High School (home of the **Tr**o**j**a**n**s)
2	MM21	Road **21** east of Road **M**
3	FF25	Road **F** south of Road **25**
4	5B35	Road **35** east of Interstate **5** **B**usiness
5	SSAC	**S**outh **Sac**ramento Street in Willows
Colusa County		
6	WIRR	**Wi**lson Avenue & abandoned **r**ail**r**oad in Colusa
7	FRES	Road 99W east of **Fres**hwater Road in Williams
8	DRYS	**Dry** **S**lough Road
9	GRAR	**Gr**imes-**Ar**buckle Road
10	PUTN	West of **Putn**am Way
11	WIRD	TECO Canal east of **Wi**ldwood **R**oa**d**
12	WHIT	Existing disk stamped **WHIT**E on White Road

The 4-character identifiers will be used in the remainder of this report to refer to the individual bench marks.

A special note about DRYS: this mark was installed in the top of an ag well concrete pump pad rather than a headwall or bridge deck. Sometimes pump pads adhere to the well casing they surround even when the adjacent land subsides, dropping away from the pad. At the time of this survey, the top of the pad (and thus DRYS) was 11 inches above the surrounding ground level. It is advised that future observations at DRYS make note of the relationship between the mark and the surrounding ground level to ensure that land subsidence doesn't go unrecorded in the event that the pump pad is supported by a well casing that extends below the subsidence zone.

Technical Overview

In general, the cost of reliably transferring heights is distance-dependent. For this reason, one of the challenges in establishing heights in areas of known or suspected land subsidence is locating stable height references that are as close as possible to the areas of interest in order to minimize cost. For this project, the results of the 2017 resurvey of the Sacramento Valley Subsidence Network conducted by the California Department of Water Resources (DWR) were reviewed to identify reference bench marks nearest the AOIs that had shown no more than modest vertical displacement over the 9-year time span encompassed by that survey.

As with the DWR survey, in this project satellite observations were used to transfer heights from the stable marks to the new marks. Some of the equipment used in the survey recorded only data from GPS (U.S. Department of Defense Global Positioning System) satellites, and some of the equipment recorded both GPS and GLN (Russian GLONASS) satellites. (As a matter of convenience, in the remainder of this document the initialization GPS will be used to refer to both types of equipment.) However, due to time constraints on the funding for this project, the work had to be completed by the end of June of 2022. This precluded the exclusive use of the long-duration (static) observation methods employed by the DWR survey. A hybrid model comprising both long- and short-duration observations was used in order to meet the completion deadline. The long-duration observations were accomplished using static GPS equipment and methods, while the short-duration observations were accomplished using a Real-Time Kinematic (RTK) system. The estimated accuracy of the resulting height values is on the order of 5 cm (0.16 ft.), compared with 2 cm (0.07 ft.) for the DWR survey.

As with the DWR survey, this project uses the NAD83 ellipsoid as the height reference, *not* NAVD88 ("sea level") elevations. **This is an important distinction that should be emphasized whenever distributing the height values resulting from this survey.**

Since the purpose of this project was to establish heights on the new bench marks, horizontal positions were not considered except to confirm that no blunders exist in the survey.

Hybrid Observation Plan

GPS observation data is used to produce position differences between two stations observed simultaneously. The data is processed and reduced to position differences between the stations. The vector representing the differences between two stations is sometimes called a baseline.

The quality of short-duration vectors degrades with distance from the base station. For this reason, many of the short-duration vectors – especially those between AOI bench marks and distant CORS – did not produce acceptable position values. This is not an error condition but rather a known limitation, and those vectors that did not meet quality control (QC) criteria of 0.07 ft. horizontal and 0.16 ft. vertical were excluded from the survey during data processing. Note that these criteria pertain only to individual vectors, not to final positions. All vectors receive a weighting value consistent with their estimated accuracy, preventing vectors on the edge of the QC criteria from contaminating the adjustment.

The 3-hour static observations provided reliable height transfer from the reference bench marks to the AOI marks, and all long-duration observations within the project area were included in the adjustment (except see the QC note below in the section on static data processing). Some of the static vectors to distant CORS were excluded for QC failures, as was expected.

Equipment Used

Observations were made with the following GPS receivers and antennas:

Type	Make	Model	Serial No.
GPS receiver	Trimble	4000SSi	3719A19275
GPS receiver	Trimble	4000SSi	3448A08932
GPS receiver	Trimble	4000SSi	3544A13149
Antenna	Trimble	Zephyr Geodetic	60046590
Antenna	Trimble	Zephyr Geodetic	12589881
Antenna	Trimble	Zephyr Geodetic	60108744
GNSS receiver w/integrated antenna	Javad	Triumph-LS	00252
GNSS receiver w/integrated antenna	Javad	Triumph-2	00023

All static and RTK base occupations were made using Seco 2-meter fixed-height tripods. Due to the presence of an adjacent chain link fence, the occupation at MM21 used a 1.00 ft. extension in order to elevate the receiver's integrated antenna above the fence. Photos were taken of this arrangement as a QC measure.

All short-duration observations were made with an adjustable-height pole and bipod. Most observations were made with the height of the receiver's Antenna Reference Point (ARP) at 5.05 ft. At stations with adjacent chain link fences (FF25, MM21 and WIRD) the ARP height was either 7.05, 7.55 or 8.05. (The deviation of 0.05 ft. from whole-foot and half-foot antenna heights is due to an offset of 0.05 ft between the rod height reading and the actual rod height caused by the quick-connect adapter used.) As a QC measure, photos were taken of the rod height reading whenever the ARP height deviated from 5.05 ft.

Reference Bench Marks

For the Glenn County AOIs, 3 stable marks from the 2017 DWR resurvey were identified such that at least 1 stable mark is within 15 km of each new mark. The proximity of the reference bench marks allowed primarily short-duration observations to be used for the height transfer to the AOI marks. The 3 stable marks from the DWR survey used for the Glenn AOIs are listed below, with their NGS PIDs (National Geodetic Survey Permanent Identifier) and the vertical displacement detected by the DWR survey in the 9 years between 2008 to 2017.

4-Char ID	Station Name	NGS PID	Displacement (ft)
Y380	Y 380	KT0225	-0.013
1118	MI 11.18	DH3662	-0.024
U107	U 1078	KT0116	-0.016

The Glenn County AOIs were divided into two groups, one comprising AOI marks 1 through 3, and one comprising AOI marks 4 and 5. In each group a base receiver was set up on one of the new marks, and a rover receiver observed short (minimum 3-minute) sessions at each of the other marks in the group, as well as at the two stable marks associated with each group. This procedure was repeated on a second day.

The Colusa County AOIs, which appear to be in a more dynamic region than the Glenn County AOIs, were treated as a single group. While one stable mark was identified relatively close (12 km) to the west of the group, the nearest stable mark to the east is about 45 km from the nearest AOIs. This distance is too far for reliable height transfer using only short-duration observations, so 3-hour observations at each of the two stable marks and at the AOI 9 mark (GRAR) were made on each of two days. This was followed by short-duration observations within the group using a base station at GRAR. As with the Glenn County AOIs, the short-duration observations were repeated on a second day in order to provide redundancy.

The stable marks identified for the Colusa AOIs are as follows:

4-Char ID	Station Name	NGS PID	Displacement (ft)
H62U	H 62	KT0414	-0.081
H380	H 380	KS0752	-0.085

See Appendix C for network diagrams.

Continuously Operating Reference Station (CORS) Application

The base receiver observations were long-duration (roughly 2-1/2 to 5 hours) on each of two days, which allowed reliable measurements to CORS in the region. The CORS ties provide a check on the heights transferred from the stable reference marks.

The CORS used for project are as follows:

4-Char ID	Station Name	NGS PID
P268	FINCHFARMSCN2005 CORS GRP	DL9236
P270	HOPKINSLGHCN2005 CORS GRP	DM7547
P336	HUBBARDRDGCN2007 CORS ARP	DK6402
ORVB	OROVILLE DAM CORS ARP	DN7510
SUTB	SUTTER BUTTES CORS POINT	AF9713

All but P270 are stable stations. P270 is located within the project area, but its time series plot shows a marked decline in height in recent years.

Data Processing Overview

Several processing schemes were applied to the observation data in order to provide robust analysis of the survey:

RTK. Although accurate station positions at the time of observation were not needed for this project, the RTK technique provides useful information about the quality of the observation in real time, thereby lending a QC measure to the survey in progress. The RTK data were stored both as real-time vectors and as raw observation files. The RTK raw observation files were processed as fast-static baselines in Trimble Business Center (TBC) v5.52, and the network was adjusted using the same application. Since these are short-duration files, they contain only enough data to reliably solve relatively short baselines. For this reason most of the RTK vectors representing long baselines were excluded from the adjustment as noted previously.

The RTK observations were a minimum of 3 minutes each in duration. However, satellite conditions sometimes caused these observations to extend, in a few cases as long as 15 or 20 minutes. These intermediate-duration files sometimes produced reliable vectors at distances longer than typically allowed by RTK.

The RTK base station files varied in duration from 2-1/2 hours to 5 hours. These were treated as static files as described below.

Since real-time vectors were available as part of the data collection process, those vectors were incorporated into a separate adjustment using Star*Net Pro v.11, along with the long-duration vectors. This adjustment was used as a check on the TBC adjustment as a QC measure. The agreement in heights between the two adjustments is around the 2-cm (0.07 ft.) level despite the different data processing methods employed.

Static. Long-duration observations were 3 hours minimum. Since unattended receivers were used at 2 of the reference bench marks, their durations ranged from 5 hours to 7 hours, providing high-quality connections to the CORS.

In addition to the 3-hour static observations, 45-minute static observations were made to check between stations WIRR and FRES, and between stations WIRR and DRYS as a QC measure. All 3 of these stations were positioned using short-duration RTK observations from GRAR. FRES and WIRR were chosen because their RTK vectors are some of the longest in the network at about 17 km. DRYS was chosen because of its long reach from WIRR at about 16 km.

To conduct the check, a receiver was set up at WIRR and 45-minute observations were taken at DRYS and at FRES. The resulting vectors were not included in the adjustment, and were used solely to provide an independent check on the height differences between the 3 stations, since the long observations can be expected to produce a more accurate result. The calculated ellipsoid height difference comparisons are as follows (values are in feet):

Vector	Static Height Difference	Adjusted RTK Height Difference	Delta
FRES-WIRR	25.738	25.692	0.046
WIRR-DRYS	-13.980	-14.007	-0.027

In addition, the 3-hour data file from the WIRR occupation was sent to the NGS OPUS service for independent processing. The OPUS-derived ellipsoid height of WIRR is -43.717 ft. versus -43.764 ft. per this survey, a difference of 0.047 ft. While these QC measures do not provide a comprehensive check of the network, they do lend support to the validity of the hybrid observation plan.

Network Adjustment

As with the DWR survey, a minimally-constrained adjustment was run fixing SUTB for latitude, longitude and ellipsoid height as published on the National Geodetic Survey (NGS) datasheet. The network resolved in 2 iterations and passed the chi-square test with an a-priori scalar of 1.21, indicating an internally consistent network. The adjustment was then rerun fixing SUTB for latitude and longitude, and fixing the reference bench marks H380, H62U, U107 and Y380 at their ellipsoid heights from the DWR survey. This adjustment also resolved in 2 iterations and passed the chi-square test with the same 1.21 scalar, indicating good agreement with the DWR survey. The resulting CORS heights agree with their published datasheet values at the 2-cm level or less with the exception of P270, which is known to be declining.

See Appendix E for the fully-constrained adjustment report summary. Page 3 of Appendix E features a histogram of standardized residuals, and it discloses a computed value that slightly exceeds the tau value determined for the adjustment, i.e. the observation is an outlier. This particular computed value is a larger-than-expected adjustment to the direction (azimuth) of a vector between P268 and GRAR; the residual is 0.03 arc-seconds. Since this project is concerned with heights rather than horizontal positions, this outlier is comfortably ignored.

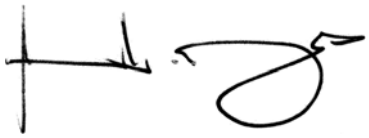
Since the project is focused on heights, there was no need to impose multiple horizontal constraints on the survey. However, the adjusted latitudes and longitudes are shown in Appendix D (Adjusted Geodetic Positions) along with the adjusted ellipsoid heights. With the exception of P206 and P268 – the CORS farthest from the project – the adjusted horizontal CORS positions are within 1 cm of their published values. P206 and P268 positions differ from published positions at the 2-cm level.

See Appendix F (Baseline Processing Summary) for a list of processed vectors used in the survey.

Recommendations

This survey established 12 new bench marks in the Colusa Subbasin that will be useful in monitoring land subsidence within the AOIs identified by the TAC. The heights determined for these marks are initial values against which future surveys can be compared to assess the location and magnitude of subsidence. However, because the values established by this survey are the product of a less-rigorous technical approach than previous subsidence surveys in the region, the next comprehensive survey will indicate rates of subsidence that should be treated with caution. Best practice would be to complete at least two additional survey events in order to assess the validity of subsidence rate calculations. In the interim, the heights established by this survey, used as a starting point for comparison with the next survey, will be useful in assessing the magnitude of subsidence at the mark locations.

Respectfully submitted,



Jim Frame

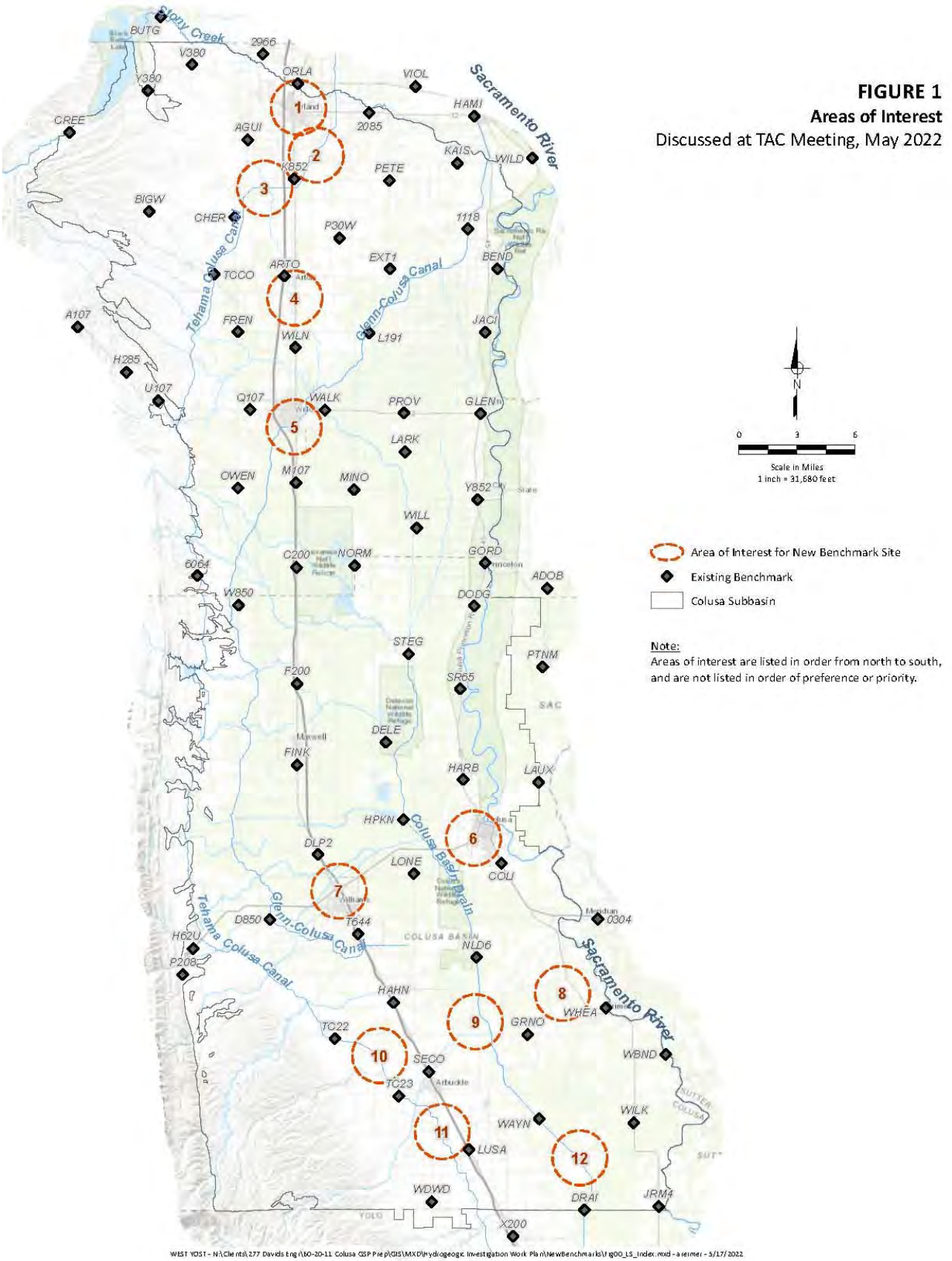


FIGURE 1
Areas of Interest
Discussed at TAC Meeting, May 2022

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Appendix B – New Bench Mark Descriptions

TRJN (AOI 1) 39°45'16.2"N 122°11'31.6"W

The station is located in Orland in Glenn County. To reach the station from the intersection of Interstate 5 and Highway 32 (Newville Road) in Orland, go southeast on Highway 32 for 0.5 mi. to 6th Street. Continue east on Highway 32 (Walker Street) for 0.3 mi. to 3rd Street. Turn left and go north on 3rd Street for 0.5 mi. to Roosevelt Avenue. Turn right and go east on Roosevelt Avenue for 200 feet and the station on the left.

The station mark is a 1" copper disk stamped TRJN set in the top of a Stony Creek Irrigation Canal headwall on the north side of Roosevelt Avenue. It is 5.1 ft. north of the south end of the headwall and 0.2 ft. west of the east face of the headwall. It is on the west side of a paved entry to a field.

Appendix B – New Bench Mark Descriptions

MM21 (AOI 2) 39°43'10.3"N 122°10'21.8"W

The station is located about 2 mi. southeast of Orland in Glenn County. To reach the station from the intersection of Interstate 5 and South Street in Orland, go east on South Street for 0.5 mi. to Road 99W. Turn right and go south on Road 99W for 1.0 mi. to Road 20. Turn left and go east on Road 20 for 1.0 mi. to Road M. Turn right and go south on Road M for 0.2 mi. to Road 21. Turn left and go east and southeast for 0.3 mi. to the Tehama-Colusa Canal and the station on the left.

The station is a 1" copper disk stamped MM21 set in the northerly corner of the bridge deck over the canal. It is 0.5 ft. southwest and 1.5 ft. southeast of the northerly corner of the deck, 0.4 ft. northeast of a guard rail, 2.7 ft. southwest of a U.S.D.I. bronze disk (inaccessible due to fencing), 0.5 ft. southwest of a chain link fence, and 2.0 ft. southeast of a paddle sign. Note regarding GNSS occupation: the adjacent chain link fence is 7 feet tall; elevating the antenna above the fence is advised.

Appendix B – New Bench Mark Descriptions

FF25 (AOI 3) 39°41'25.5"N 122°14'2.5"W

The station is located about 4 mi. southwest of Orland in Glenn County. To reach the station from the intersection of Interstate 5 and Road 27, go west on Road 27 for 1.5 mi. to Road F. Turn right and go north on Road F for 0.5 mi. to the Tehama-Colusa Canal and the station on the right.

The station is a 1" copper disk stamped FF25 set in the northeast corner of the bridge deck over the canal. It is 1.3 ft. south and 0.4 ft. west of the northeast corner of the deck, 1.4 ft. west of a U.S.D.I. bronze disk (inaccessible due to fencing), 0.4 ft. east of a guard rail, 1.5 ft. south of a paddle sign, and 1.1 ft. west of a chain link fence. Note regarding GNSS occupation: the adjacent chain link fence is 7 feet tall; elevating the antenna above the fence is advised.

Appendix B – New Bench Mark Descriptions

5B35 (AOI 4) 39°36'40.8"N 122°10'35.1"W

The station is located about 1 mile east of Artois in Glenn County. To reach the station from the intersection of Interstate 5 and Road 33, go east on Road 33 for 0.6 mi. to Road 99W. Turn right and go south on Road 99W for 0.9 mi. to Road 35. Turn left and go east on Road 35 for 0.9 mi. to the station on the left.

The station is a 1/8" drill hole in the top of a welded steel D set in the north face of the concrete wingwall of a bridge over an irrigation canal. A copper tag stamped 5B35 is wired to the D. It is 0.4 ft. east of the west end of the wingwall, 18.5 ft. north of the centerline of the road, 6.0 ft. northwest of a paddle sign, 1.8 ft. below the top of the wingwall, and about 3.5 ft. below the road.

Appendix B – New Bench Mark Descriptions

SSAC (AOI 5) 39°31'01.3"N 122°11'21.55"W

The station is located on the southeast side of Willows in Glenn County. To reach the station from the intersection of Interstate 5 and Highway 162, go east on Highway 162 for 1.4 mi. to North Sacramento Street. Turn right and go south on North Sacramento Street for 0.2 mi. to East Sycamore Street. Continue south on South Sacramento Street for 0.2 mi. to the Glenn-Colusa Canal and the station on the right.

The station is a 1" copper disk stamped SSAC set in the top of the concrete wheelguard at the westerly corner of Bridge 11C0055 over the canal. It is 1.8 ft. east of the west end of the wheelguard, 3.2 ft. northwest of the northwest end of the bridge deck, 12 ft. southwest of the centerline of the road, and 1.0 ft. south of a paddle sign.

Appendix B – New Bench Mark Descriptions

WIRR (AOI 6) 39°12'35.1"N 122° 01'28.7"W

The station is located on the west side of Colusa in Colusa County. To reach the station from the intersection of Highway 45 and Highway 20 in Colusa, go southwest on Highway 20 for 0.4 mi. to Fremont Street. Turn right and go northwest on Fremont Street for 0.2 mi. to 13th Street. Turn left and go southwest on 13th Street for 0.05 mi. to Wilson Avenue. Turn right and go west on Wilson Avenue for 0.2 mi. and the station on the left.

The station is a 1" copper disk stamped WIRR set in the top of the east end of the north concrete abutment of an abandoned railroad bridge over a small canal on the south side of Wilson Road. It is 1.0 ft. south and 0.5 ft. east of the northeast corner of the east bridge beam, 1.3 ft. below the top of the beam, and 31.5 ft. south of the centerline of the road.

Appendix B – New Bench Mark Descriptions

FRES (AOI 7) 39° 09'45.2"N 122° 09'11.81"W

The station is located on the north side of Williams in Colusa County. To reach the station from the intersection of Highway 20 and Road 99W, go south on Road 99W for 0.2 mi. and the station on the right.

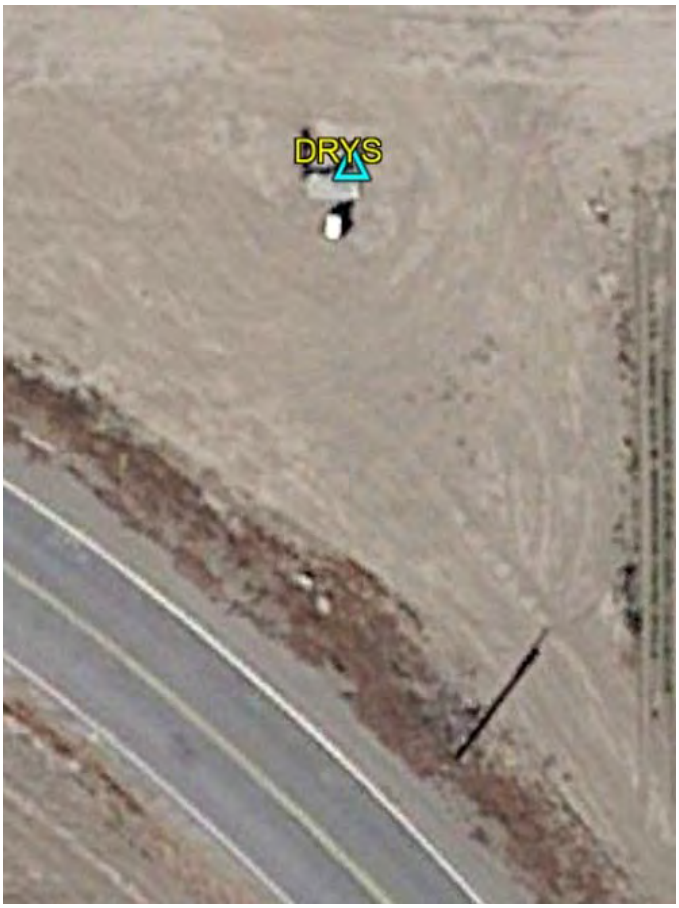
The station is a 1" copper disk stamped FRES set in the top of a concrete wingwall of an irrigation canal culvert on the west side of Road 99W. It is 1.0 ft. south of the north end of the wingwall and about 50 ft. west of the centerline of the highway.

Appendix B – New Bench Mark Descriptions

DRYS (AOI 8) 39° 04'41.4"N 121°56'51.1"W

The station is located about 7 miles northeast of Arbuckle in Colusa County. To reach the station from the intersection of Road 99W and Grimes-Arbuckle Road, go east on Grimes-Arbuckle Road for 2.0 mi. to Tule Road. Turn left and continue north on Grimes-Arbuckle Road for 3.0 mi. to Hahn Road. Turn right and continue east on Grimes-Arbuckle Road 3.9 mi. to Dry Slough Road. Turn left and go north and northwest for 1.6 mi. and the station on the right.

The station is a 1" copper disk stamped DRYS set in the northeast corner of an agricultural well pump concrete pad. It is 0.5 ft. south and 0.5 west of the northeast corner of the concrete pad, and about 80 ft. northeast of the centerline of the road.



Appendix B – New Bench Mark Descriptions

GRAR (AOI 9) 39° 03'23.9"N 122° 00'56.5"W

The station is located about 3 miles northwest of Arbuckle in Colusa County. To reach the station from the intersection of Road 99W and Grimes-Arbuckle Road, go east on Grimes-Arbuckle Road for 2.0 mi. to Tule Road. Turn left and continue north on Grimes-Arbuckle Road for 3.0 mi. to Hahn Road and the station straight ahead.

The station is a 1" copper disk stamped GRAR set in the top of the east end of a concrete wingwall on the south side of a bridge over Salt Creek. It is 0.3 ft. north of and 2.9 ft. west of the east end of the wingwall, and about 43 feet north of the centerline of the paved road.

Appendix B – New Bench Mark Descriptions

PUTN (AOI 10) 39° 02'19.1"N 122° 06'34.28"W

The station is located about 3 mi. northwest of Arbuckle in Colusa County. To reach the station from the intersection of Interstate 5 and the underpass road at Exit 567 in Arbuckle, go west on the underpass road for 300 ft. to Putnam Way. Turn right and go north on Putnam Way for 1.4 mi. to the end of the pavement. Turn left through the gate and go west for 1.3 mi. to a farm road left. Turn left and go south on the farm road for 0.1 mi. to a farm road right. Turn right and go west on the farm road for 0.6 mi. to the station on the right.

The station is a 1" copper disk stamped PUTN set in the top of the west side of the south concrete abutment of a bridge over the North Branch of Sand Creek. It is 0.8 ft. north and 0.7 ft. west of the southwest corner of the bridge deck.

Appendix B – New Bench Mark Descriptions

WIRD (AOI 11) 38°58'36.0"N 122° 03'4.2"W

The station is located about 3 miles south of Arbuckle in Colusa County. To reach the station from the intersection of Interstate 5 and the underpass road at Exit 567 in Arbuckle, go west on the underpass road for 300 ft. to Wildwood Road. Turn left and go south on Wildwood Road for 1.0 mi. to a 90-degree turn to the right. Follow the road and continue west on Wildwood Road for 0.2 mi. to Wagner Avenue. Turn left and continue south on Wildwood Road for 1.5 mi. to Nonpareil Avenue. Turn left and go east on Nonpareil Avenue for 0.5 mi. to the Tehama-Colusa Canal and the station on the right.

The station is a 1" copper disk stamped WIRD set in the southwest corner of a bridge over the Tehama-Colusa Canal. It is 1.0 ft. north of and 0.8 ft. east of the southwest corner of the bridge deck.

Appendix B – New Bench Mark Descriptions

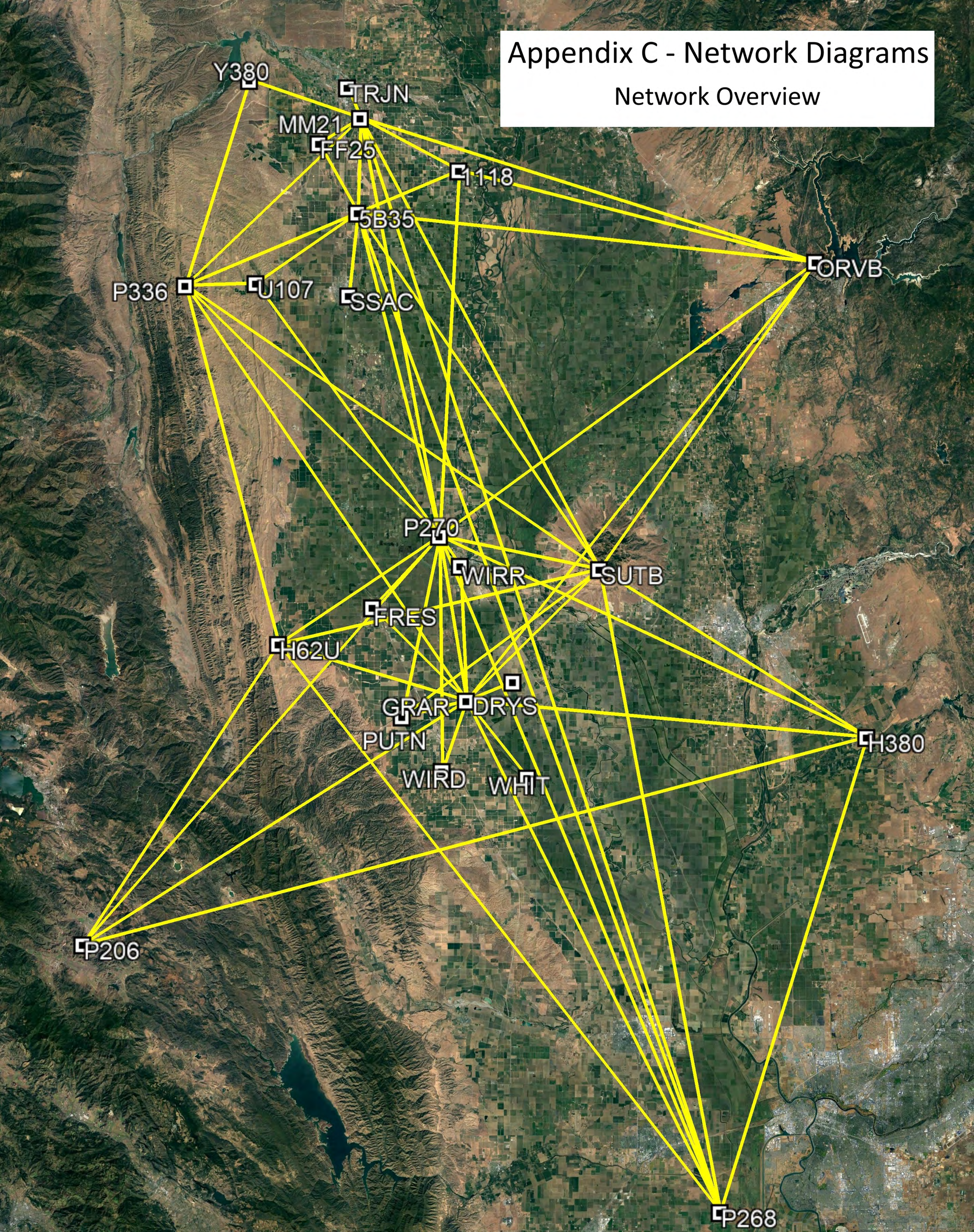
WHIT (AOI 12) 38°58'09.0"N 121°55'35.5"W

The station is located about 8 miles southeast of Arbuckle in Colusa County. To reach the station from the intersection of Interstate 5 and County Line Road, go east on County Line Road for 0.6 mi. to Grevie Road. Turn left and go north on Grevie Road for 3.0 mi. to White Road. Turn right and go east on White Road for 3.3 mi. to the Colusa Basin Drain and the station on the left.

The station is a 2" bronze disk stamped WHITE set in the northeast corner of a bridge over the Colusa Basin Drain. It is 0.8 ft. south of and 1.1 ft. west of the corner of the bridge deck.

Appendix C - Network Diagrams

Network Overview

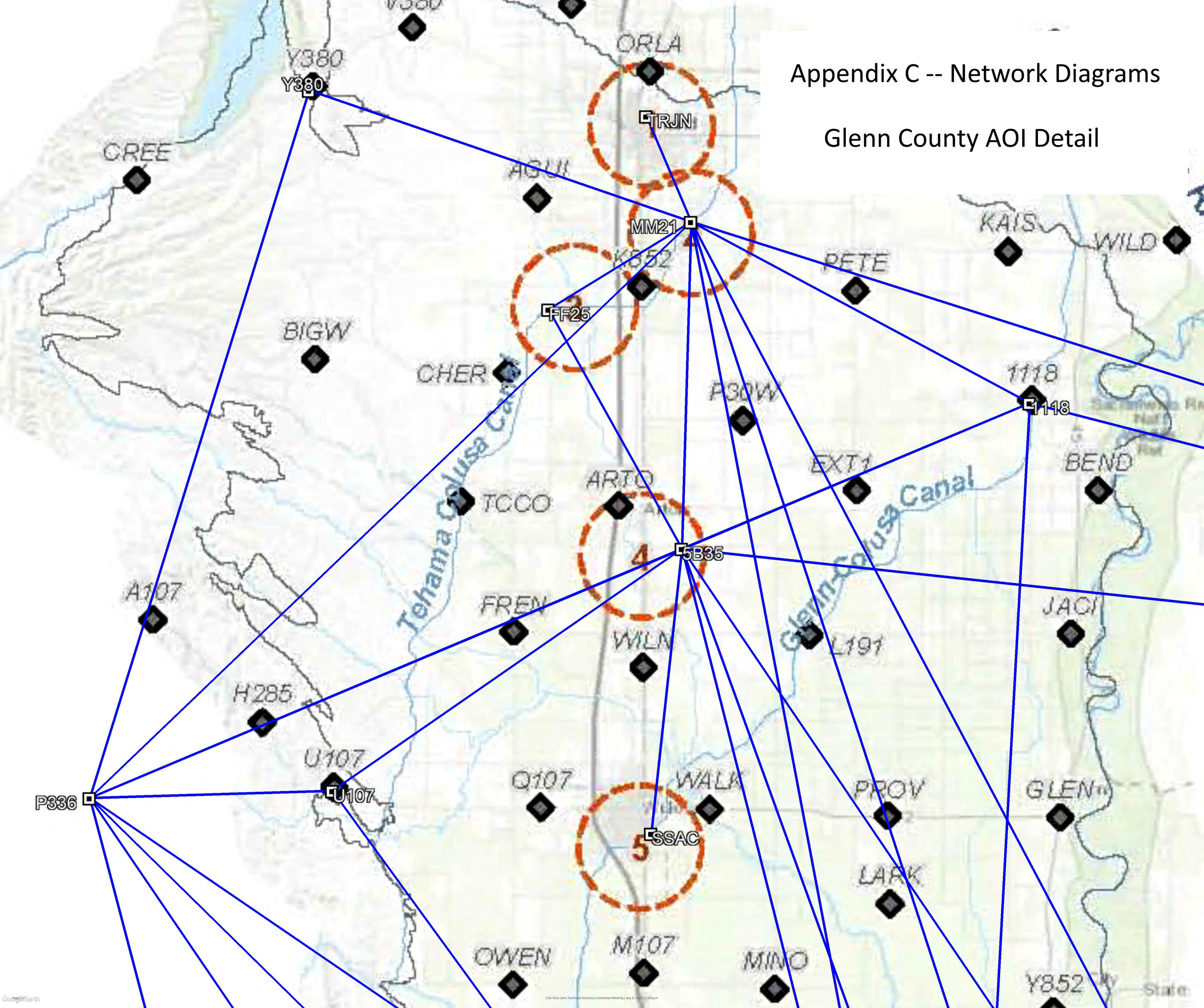


Appendix C -- Network Diagrams

Areas of Interest Detail

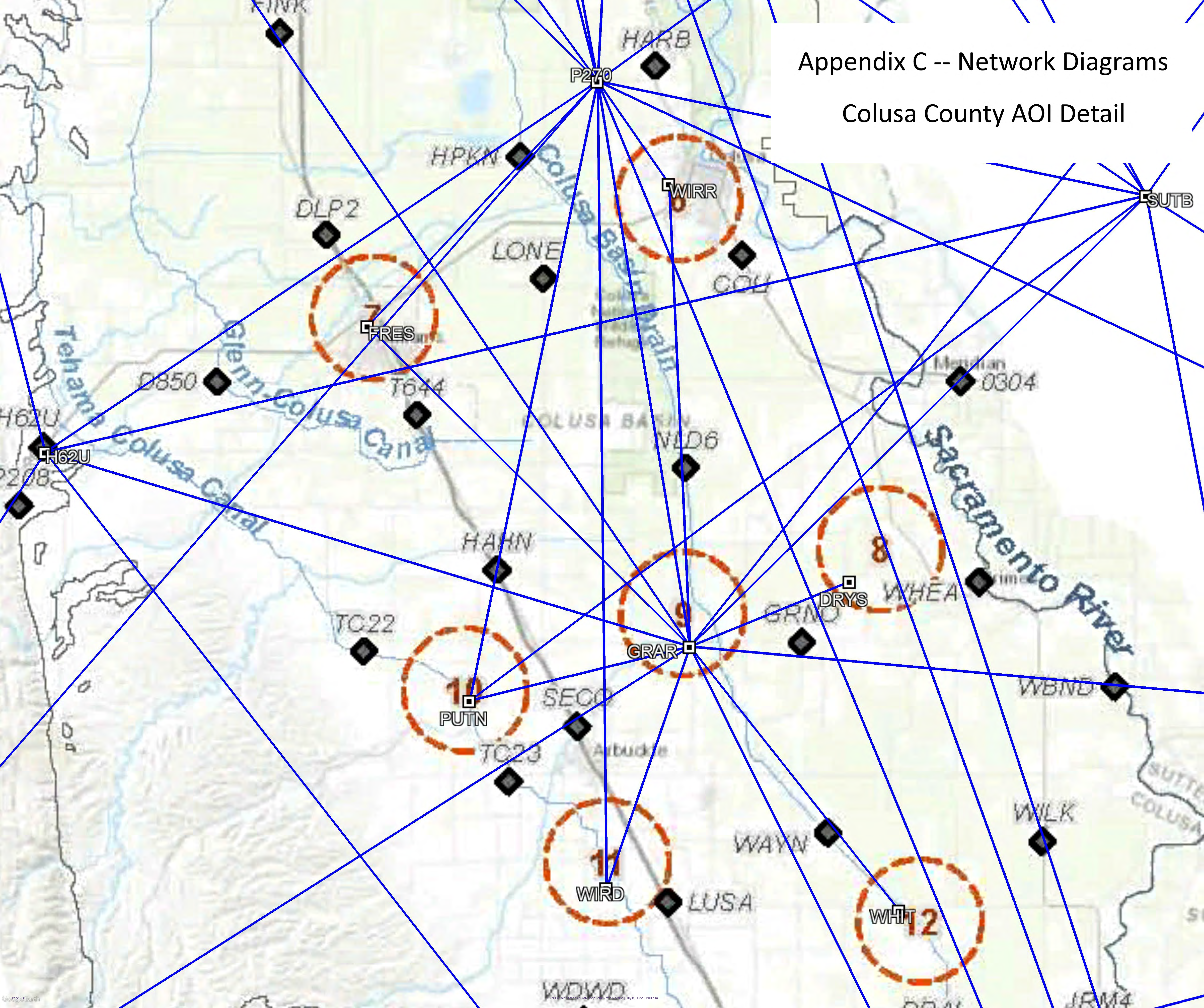
Appendix C -- Network Diagrams

Glenn County AOI Detail



Appendix C -- Network Diagrams

Colusa County AOI Detail



Appendix D
Adjusted Geodetic Positions

Mark ID	Latitude	Longitude	Height (Feet)	Height Error (Feet)
1118	N39°39'34.82002"	W122°01'36.97720"	55.65	FIXED
5B35	N39°36'40.84368"	W122°10'35.03148"	55.17	0.028
DRYS	N39°04'41.36489"	W121°56'51.04063"	-57.77	0.031
FF25	N39°41'25.53550"	W122°14'02.34506"	132.54	0.039
FRES	N39°09'45.22381"	W122°09'11.76130"	-18.07	0.052
GRAR	N39°03'23.83581"	W122°00'56.47164"	-50.19	0.019
H380	N39°00'49.80245"	W121°25'46.20557"	-14.71	FIXED
H62U	N39°07'14.13841"	W122°17'27.39154"	127.36	FIXED
MM21	N39°43'10.31972"	W122°10'21.70005"	135.86	0.028
ORVB	N39°33'16.64458"	W121°30'00.99475"	1117.16	0.035
P206	N38°46'40.13072"	W122°34'32.80284"	932.02	0.038
P268	N38°28'24.68144"	W121°38'47.02836"	-76.94	0.042
P270	N39°14'37.55838"	W122°03'18.71387"	-39.06	0.014
P336	N39°31'41.07510"	W122°25'49.68730"	942.19	0.021
PUTN	N39°02'19.07488"	W122°06'34.25346"	86.04	0.042
SSAC	N39°31'01.30777"	W122°11'21.46760"	42.46	0.064
SUTB	N39°12'20.99670"	W121°49'14.10397"	2024.43	0.019
TRJN	N39°45'16.12870"	W122°11'31.50973"	164.84	0.047
U107	N39°31'51.03637"	W122°19'34.37240"	212.19	FIXED
WHIT	N38°58'09.03842"	W121°55'35.48094"	-51.53	0.049
WIRD	N38°58'35.99420"	W122°03'04.17376"	89.38	0.042
WIRR	N39°12'35.05663"	W122°01'28.65795"	-43.76	0.034
Y380	N39°45'45.77826"	W122°20'14.55489"	367.31	FIXED

Appendix E

Network Adjustment Report Summary

Adjustment Settings

Set-Up Errors

GNSS

Error in Height of Antenna: 0.005 ft

Centering Error: 0.001 ft

Covariance Display

Horizontal:

Propagated Linear Error [E]: U.S.

Constant Term [C]: 0.000 ft

Scale on Linear Error [S]: 1.000

Three-Dimensional

Propagated Linear Error [E]: U.S.

Constant Term [C]: 0.000 ft

Scale on Linear Error [S]: 1.000

Adjustment Statistics

Number of Iterations for Successful Adjustment: 2

Network Reference Factor: 1.00

Chi Square Test (95%): Passed

Precision Confidence Level: DRMS

Degrees of Freedom: 341

Post Processed Vector Statistics

Reference Factor: 1.00

Redundancy Number: 341.00

A Priori Scalar: 1.21

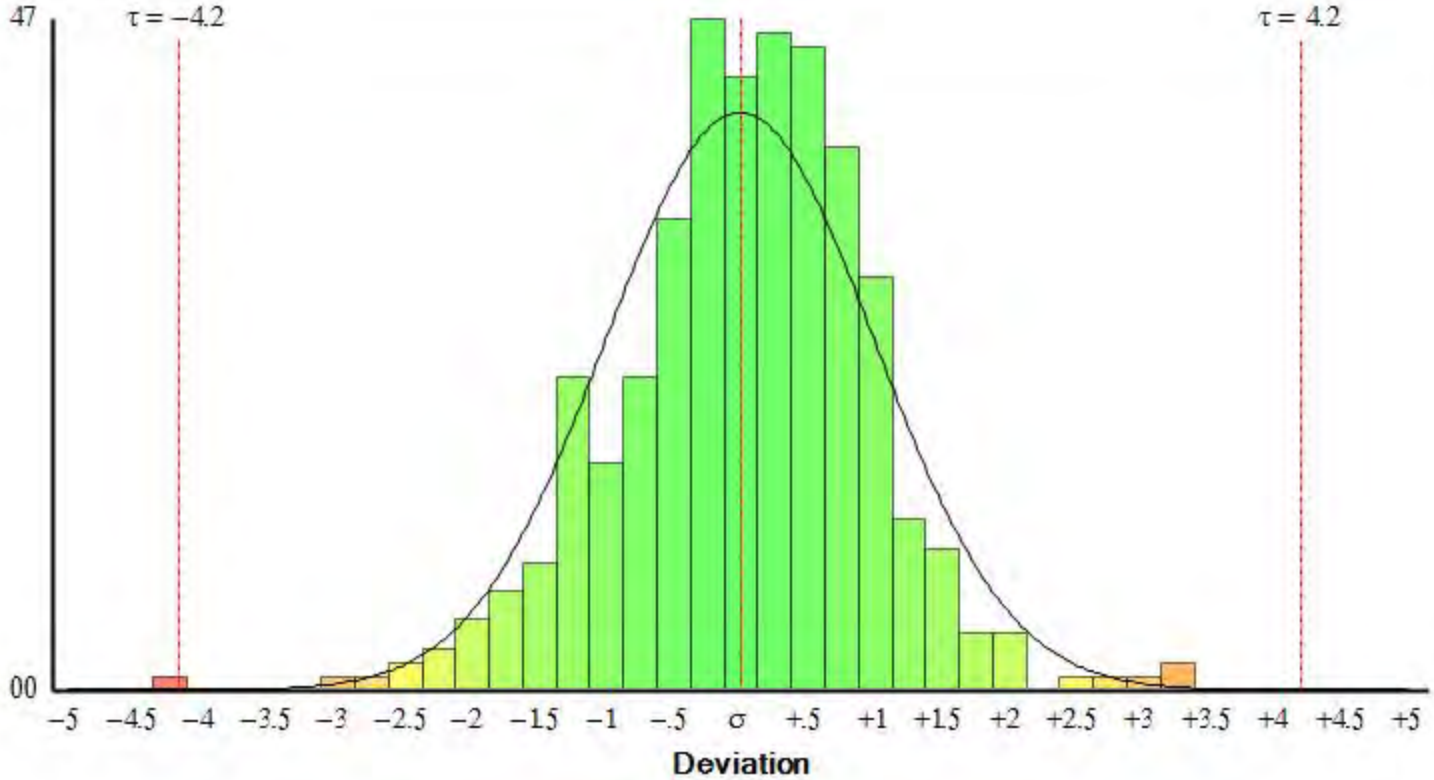
Control Coordinate Comparisons

Values shown are control coordinates minus adjusted coordinates.

Point ID	ΔNorthing (US survey foot)	ΔEasting (US survey foot)	ΔElevation (US survey foot)	ΔHeight (US survey foot)
SUTB	?	?	?	0.036

Control Point Constraints

Point ID	Type	North σ (US survey foot)	East σ (US survey foot)	Height σ (US survey foot)	Elevation σ (US survey foot)
1118	Global			Fixed	
H380	Global			Fixed	
H62U	Global			Fixed	
SUTB	Global	Fixed	Fixed		
U107	Global			Fixed	
Y380	Global			Fixed	
Fixed = 0.000003(US survey foot)					



Histogram of Standardized Residuals

Appendix F – Baseline Processing Summary

Observation	Occupation Start Time	Occupation Stop Time	Solution Type	H. Prec. (US survey foot)	V. Prec. (US survey foot)	Geodetic Az.	Ellipsoid Dist. (US survey foot)	ΔHeight (US survey foot)
MM21 --- 5B35 (B1)	6/2/2022 1:02:20 PM	6/2/2022 1:32:34 PM	Fixed	0.023	0.048	181°30'59.7"	39422.833	-80.758
MM21 --- FF25 (B2)	6/2/2022 9:05:45 AM	6/2/2022 9:11:54 AM	Fixed	0.036	0.048	238°26'07.4"	20243.637	-3.287
MM21 --- TRJN (B3)	6/2/2022 9:30:12 AM	6/2/2022 9:35:35 AM	Fixed	0.036	0.058	336°48'57.3"	13849.119	28.966
MM21 --- Y380 (B4)	6/2/2022 9:54:31 AM	6/2/2022 10:01:34 AM	Fixed	0.043	0.095	288°48'47.8"	48910.137	231.397
MM21 --- 1118 (B5)	6/2/2022 10:36:07 AM	6/2/2022 10:41:28 AM	Fixed	0.051	0.117	117°56'51.7"	46455.349	-80.354
MM21 --- FF25 (B6)	6/2/2022 11:06:41 AM	6/2/2022 11:12:36 AM	Fixed	0.037	0.053	238°26'07.0"	20243.641	-3.345
MM21 --- TRJN (B7)	6/2/2022 11:28:55 AM	6/2/2022 11:34:03 AM	Fixed	0.039	0.046	336°48'57.1"	13849.084	29.008
MM21 --- Y380 (B8)	6/2/2022 11:54:41 AM	6/2/2022 11:59:56 AM	Fixed	0.076	0.078	288°48'47.5"	48910.128	231.519
MM21 --- 1118 (B9)	6/2/2022 12:35:12 PM	6/2/2022 12:40:42 PM	Fixed	0.076	0.103	117°56'51.9"	46455.352	-80.212
GRAR --- H380 (B10)	6/6/2022 10:03:42 AM	6/6/2022 1:04:27 PM	Fixed	0.039	0.099	95°09'43.5"	167242.499	35.351
H62U --- GRAR (B12)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.013	0.066	106°31'08.5"	81532.208	-177.575
5B35 --- SSAC (B13)	6/7/2022 8:42:40 AM	6/7/2022 8:47:19 AM	Fixed	0.068	0.104	186°02'48.1"	34547.210	-12.693
5B35 --- U107 (B15)	6/7/2022 9:22:22 AM	6/7/2022 9:30:59 AM	Fixed	0.043	0.084	235°16'31.4"	51416.279	157.064
5B35 --- FF25 (B16)	6/7/2022 10:00:02 AM	6/7/2022 10:04:03 AM	Fixed	0.048	0.124	330°38'32.7"	33056.855	77.393
5B35 --- 1118 (B18)	6/7/2022 10:28:25 AM	6/7/2022 10:36:49 AM	Fixed	0.045	0.079	67°15'29.2"	45627.406	0.394
GRAR --- WHIT (B20)	6/8/2022 8:02:33 AM	6/8/2022 8:11:25 AM	Fixed	0.058	0.068	141°28'09.1"	40697.683	-1.319
GRAR --- WIRD (B22)	6/8/2022 8:29:17 AM	6/8/2022 8:39:01 AM	Fixed	0.038	0.049	199°06'07.8"	30816.846	139.501
GRAR --- PUTN (B23)	6/8/2022 8:59:11 AM	6/8/2022 9:03:30 AM	Fixed	0.047	0.078	256°12'58.6"	27442.412	136.213
GRAR --- PUTN (B24)	6/8/2022 9:03:32 AM	6/8/2022 9:07:47 AM	Fixed	0.046	0.077	256°12'58.5"	27442.403	136.237
GRAR --- FRES (B26)	6/8/2022 9:36:16 AM	6/8/2022 9:44:35 AM	Fixed	0.037	0.086	314°42'30.0"	54892.124	32.091
GRAR --- H62U (B29)	6/8/2022 10:01:01 AM	6/8/2022 10:14:42 AM	Fixed	0.036	0.095	106°31'08.5"	81532.231	-177.492
GRAR --- WIRR (B31)	6/8/2022 10:37:22 AM	6/8/2022 10:46:19 AM	Fixed	0.044	0.067	357°23'56.3"	55827.627	6.370
GRAR --- DRYS (B33)	6/8/2022 11:07:39 AM	6/8/2022 11:15:43 AM	Fixed	0.020	0.024	67°55'12.0"	20886.352	-7.577
MM21 --- FF25 (B35)	6/9/2022 8:52:42 AM	6/9/2022 9:02:59 AM	Fixed	0.033	0.049	238°26'07.0"	20243.592	-3.353
MM21 --- TRJN (B37)	6/9/2022 9:18:22 AM	6/9/2022 9:26:30 AM	Fixed	0.028	0.057	336°48'57.0"	13849.073	28.914
MM21 --- Y380 (B38)	6/9/2022 9:44:59 AM	6/9/2022 10:06:32 AM	Fixed	0.033	0.088	288°48'47.8"	48910.065	231.287
MM21 --- 1118 (B40)	6/9/2022 10:42:36 AM	6/9/2022 10:52:00 AM	Fixed	0.058	0.078	117°56'51.9"	46455.357	-80.117
P270 --- H62U (B41)	6/6/2022 8:06:12 AM	6/6/2022 3:06:27 PM	Fixed	0.018	0.073	236°11'59.4"	80490.337	166.421
P270 --- H380 (B42)	6/6/2022 10:03:42 AM	6/6/2022 1:04:27 PM	Fixed	0.030	0.067	115°03'38.8"	196268.620	24.246
P270 --- GRAR (B43)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.013	0.063	170°39'07.3"	69079.297	-11.157
P270 --- 1118 (B44)	6/9/2022 10:42:36 AM	6/9/2022 10:52:00 AM	Fixed	0.071	0.098	3°00'23.3"	151704.488	94.852
P270 --- MM21 (B48)	6/9/2022 8:32:26 AM	6/9/2022 11:10:38 AM	Fixed	0.028	0.086	349°12'11.5"	176444.822	174.915

P270 --- 5B35 (B57)	6/2/2022 1:02:20 PM	6/2/2022 1:32:34 PM	Fixed	0.028	0.145	345°41'40.6"	138198.886	93.934
P270 --- MM21 (B58)	6/2/2022 8:43:48 AM	6/2/2022 1:48:06 PM	Fixed	0.019	0.050	349°12'11.6"	176444.782	174.928
P270 --- 1118 (B59)	6/7/2022 10:28:25 AM	6/7/2022 10:36:49 AM	Fixed	0.060	0.113	3°00'23.2"	151704.474	94.684
P270 --- U107 (B61)	6/7/2022 9:22:22 AM	6/7/2022 9:30:59 AM	Fixed	0.050	0.096	323°51'37.6"	129623.590	251.213
P270 --- 5B35 (B63)	6/7/2022 8:19:49 AM	6/7/2022 10:54:04 AM	Fixed	0.015	0.065	345°41'40.7"	138198.864	94.267
P270 --- WIRR (B65)	6/8/2022 10:37:22 AM	6/8/2022 10:46:19 AM	Fixed	0.022	0.033	145°02'45.4"	15120.456	-4.706
P270 --- H62U (B66)	6/8/2022 10:01:01 AM	6/8/2022 10:14:42 AM	Fixed	0.056	0.163	236°11'56.2"	80488.061	166.220
P270 --- FRES (B67)	6/8/2022 9:36:16 AM	6/8/2022 9:44:35 AM	Fixed	0.026	0.061	223°14'54.1"	40585.898	20.959
P270 --- PUTN (B68)	6/8/2022 9:03:32 AM	6/8/2022 9:07:47 AM	Fixed	0.063	0.095	191°40'05.2"	76288.303	125.028
P270 --- PUTN (B69)	6/8/2022 8:59:11 AM	6/8/2022 9:03:30 AM	Fixed	0.060	0.087	191°40'05.2"	76288.291	125.043
P270 --- WIRD (B70)	6/8/2022 8:29:17 AM	6/8/2022 8:39:01 AM	Fixed	0.085	0.105	179°19'25.5"	97293.011	128.360
P270 --- GRAR (B72)	6/8/2022 7:41:15 AM	6/8/2022 11:25:40 AM	Fixed	0.012	0.044	170°39'07.2"	69079.297	-11.084
P270 --- P268 (B73)	6/1/2022 4:59:42 PM	6/2/2022 4:59:12 PM	Fixed	0.007	0.016	157°20'03.2"	303728.607	-37.938
P268 --- MM21 (B83)	6/2/2022 8:43:48 AM	6/2/2022 1:48:06 PM	Fixed	0.018	0.049	341°56'49.8"	477781.189	212.864
P270 --- P336 (B85)	6/1/2022 4:59:42 PM	6/2/2022 4:59:12 PM	Fixed	0.004	0.013	314°25'55.3"	148242.482	981.267
P336 --- 1118 (B86)	6/2/2022 12:35:12 PM	6/2/2022 12:40:42 PM	Fixed	0.073	0.107	67°00'55.4"	123411.013	-886.483
P336 --- Y380 (B87)	6/2/2022 11:54:41 AM	6/2/2022 11:59:56 AM	Fixed	0.109	0.099	17°01'19.4"	89400.729	-574.784
P336 --- Y380 (B91)	6/2/2022 9:54:31 AM	6/2/2022 10:01:34 AM	Fixed	0.048	0.107	17°01'19.3"	89400.749	-574.911
P336 --- 5B35 (B94)	6/2/2022 1:02:20 PM	6/2/2022 1:32:34 PM	Fixed	0.031	0.163	66°58'04.4"	77783.584	-887.229
P336 --- MM21 (B95)	6/2/2022 8:43:48 AM	6/2/2022 1:48:06 PM	Fixed	0.013	0.048	46°04'26.7"	100679.951	-806.357
P336 --- SUTB (B96)	6/1/2022 4:59:42 PM	6/2/2022 4:59:12 PM	Fixed	0.010	0.027	304°26'10.6"	208591.544	-1082.229
P270 --- SUTB (B98)	6/1/2022 4:59:42 PM	6/2/2022 4:59:12 PM	Fixed	0.007	0.025	281°49'02.2"	67888.230	-2063.483
SUTB --- 5B35 (B107)	6/2/2022 1:02:20 PM	6/2/2022 1:32:34 PM	Fixed	0.038	0.164	325°52'14.9"	178677.964	-1969.185
SUTB --- MM21 (B108)	6/2/2022 8:43:48 AM	6/2/2022 1:48:06 PM	Fixed	0.025	0.070	332°07'46.5"	211887.236	-1888.552
P270 --- P268 (B109)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.017	0.043	157°20'03.1"	303728.602	-37.936
P268 --- H62U (B110)	6/6/2022 8:06:12 AM	6/6/2022 3:06:27 PM	Fixed	0.016	0.042	322°15'53.5"	298809.775	204.366
P268 --- H380 (B111)	6/6/2022 10:03:42 AM	6/6/2022 1:04:27 PM	Fixed	0.020	0.060	17°23'03.1"	206280.504	62.250
P268 --- GRAR (B112)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.019	0.054	333°44'29.3"	237041.719	26.793
P270 --- P336 (B114)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.009	0.031	314°25'55.3"	148242.473	981.224
P336 --- H62U (B115)	6/6/2022 8:06:12 AM	6/6/2022 3:06:27 PM	Fixed	0.011	0.045	165°03'46.1"	153581.977	-814.853
P336 --- GRAR (B117)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.022	0.062	145°30'37.4"	208016.500	-992.399
P336 --- SUTB (B118)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.011	0.031	304°26'10.6"	208591.527	-1082.214
P270 --- SUTB (B120)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.010	0.032	281°49'02.2"	67888.234	-2063.477
SUTB --- H62U (B121)	6/6/2022 8:06:12 AM	6/6/2022 3:06:27 PM	Fixed	0.019	0.082	257°02'39.9"	136936.904	-1897.043
SUTB --- H380 (B122)	6/6/2022 10:03:42 AM	6/6/2022 1:04:27 PM	Fixed	0.031	0.132	122°05'36.8"	131172.152	-2039.128
SUTB --- GRAR (B123)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.022	0.107	225°35'00.8"	77568.728	-2074.655
P270 --- P268 (B124)	6/6/2022 4:59:42 PM	6/7/2022 4:59:12 PM	Fixed	0.006	0.015	157°20'03.2"	303728.604	-37.950

P268 --- 5B35 (B129)	6/7/2022 8:19:49 AM	6/7/2022 10:54:04 AM	Fixed	0.022	0.066	340°12'10.6"	440916.921	132.221
P270 --- P336 (B131)	6/6/2022 4:59:42 PM	6/7/2022 4:59:12 PM	Fixed	0.004	0.013	314°25'55.3"	148242.478	981.294
P336 --- 1118 (B132)	6/7/2022 10:28:25 AM	6/7/2022 10:36:49 AM	Fixed	0.056	0.104	67°00'55.3"	123410.928	-886.609
P336 --- U107 (B134)	6/7/2022 9:22:22 AM	6/7/2022 9:30:59 AM	Fixed	0.038	0.070	88°00'14.0"	29424.913	-729.983
P336 --- 5B35 (B136)	6/7/2022 8:19:49 AM	6/7/2022 10:54:04 AM	Fixed	0.013	0.054	66°58'04.5"	77783.620	-886.955
P336 --- SUTB (B137)	6/6/2022 4:59:42 PM	6/7/2022 4:59:12 PM	Fixed	0.013	0.035	304°26'10.6"	208591.535	-1082.162
P270 --- SUTB (B139)	6/6/2022 4:59:42 PM	6/7/2022 4:59:12 PM	Fixed	0.010	0.033	281°49'02.2"	67888.221	-2063.470
SUTB --- 5B35 (B144)	6/7/2022 8:19:49 AM	6/7/2022 10:54:04 AM	Fixed	0.029	0.089	325°52'14.9"	178677.878	-1969.165
P270 --- P268 (B156)	6/7/2022 4:59:42 PM	6/8/2022 4:59:12 PM	Fixed	0.012	0.029	157°20'03.2"	303728.620	-37.935
P268 --- GRAR (B165)	6/8/2022 7:41:15 AM	6/8/2022 11:25:40 AM	Fixed	0.016	0.041	333°44'29.3"	237041.712	26.841
P270 --- SUTB (B168)	6/7/2022 4:59:42 PM	6/8/2022 4:59:12 PM	Fixed	0.009	0.027	281°49'02.2"	67888.235	-2063.467
SUTB --- H62U (B171)	6/8/2022 10:01:01 AM	6/8/2022 10:14:42 AM	Fixed	0.022	0.169	257°02'38.5"	136934.995	-1897.432
SUTB --- PUTN (B174)	6/8/2022 8:59:11 AM	6/8/2022 9:03:30 AM	Fixed	0.103	0.152	233°28'56.1"	102120.270	-1938.491
SUTB --- GRAR (B177)	6/8/2022 7:41:15 AM	6/8/2022 11:25:40 AM	Fixed	0.019	0.073	225°35'00.7"	77568.717	-2074.518
P270 --- P268 (B178)	6/8/2022 4:59:42 PM	6/9/2022 4:59:12 PM	Fixed	0.011	0.027	157°20'03.2"	303728.613	-37.928
P268 --- MM21 (B183)	6/9/2022 8:32:26 AM	6/9/2022 11:10:38 AM	Fixed	0.025	0.078	341°56'49.8"	477781.234	212.860
P270 --- P336 (B185)	6/8/2022 4:59:42 PM	6/9/2022 4:59:12 PM	Fixed	0.006	0.019	314°25'55.3"	148242.490	981.278
P336 --- 1118 (B186)	6/9/2022 10:42:36 AM	6/9/2022 10:52:00 AM	Fixed	0.064	0.088	67°00'55.3"	123410.930	-886.354
P336 --- Y380 (B187)	6/9/2022 9:44:59 AM	6/9/2022 10:06:32 AM	Fixed	0.031	0.091	17°01'19.3"	89400.773	-574.963
P336 --- MM21 (B190)	6/9/2022 8:32:26 AM	6/9/2022 11:10:38 AM	Fixed	0.018	0.076	46°04'26.5"	100679.932	-806.335
P336 --- SUTB (B191)	6/8/2022 4:59:42 PM	6/9/2022 4:59:12 PM	Fixed	0.009	0.025	304°26'10.6"	208591.536	-1082.185
P270 --- SUTB (B193)	6/8/2022 4:59:42 PM	6/9/2022 4:59:12 PM	Fixed	0.008	0.025	281°49'02.2"	67888.237	-2063.465
SUTB --- MM21 (B198)	6/9/2022 8:32:26 AM	6/9/2022 11:10:38 AM	Fixed	0.034	0.104	332°07'46.4"	211887.267	-1888.551
P270 --- ORVB (B202)	6/1/2022 4:59:42 PM	6/2/2022 4:59:12 PM	Fixed	0.005	0.012	53°59'38.6"	193426.769	1156.208
ORVB --- 5B35 (B211)	6/2/2022 1:02:20 PM	6/2/2022 1:32:34 PM	Fixed	0.048	0.164	276°24'11.2"	191687.777	-1062.146
ORVB --- MM21 (B212)	6/2/2022 8:43:48 AM	6/2/2022 1:48:06 PM	Fixed	0.017	0.048	287°48'47.1"	198678.366	-981.258
P270 --- ORVB (B216)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.007	0.020	53°59'38.6"	193426.767	1156.251
ORVB --- GRAR (B219)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.019	0.059	218°57'53.3"	232756.646	-1167.409
P270 --- ORVB (B223)	6/6/2022 4:59:42 PM	6/7/2022 4:59:12 PM	Fixed	0.008	0.023	53°59'38.6"	193426.767	1156.196
ORVB --- 5B35 (B228)	6/7/2022 8:19:49 AM	6/7/2022 10:54:04 AM	Fixed	0.018	0.053	276°24'11.2"	191687.727	-1061.899
P270 --- ORVB (B232)	6/7/2022 4:59:42 PM	6/8/2022 4:59:12 PM	Fixed	0.009	0.025	53°59'38.6"	193426.775	1156.187
ORVB --- GRAR (B241)	6/8/2022 7:41:15 AM	6/8/2022 11:25:40 AM	Fixed	0.017	0.046	218°57'53.2"	232756.620	-1167.246
P270 --- ORVB (B245)	6/8/2022 4:59:42 PM	6/9/2022 4:59:12 PM	Fixed	0.005	0.014	53°59'38.6"	193426.770	1156.196
ORVB --- 1118 (B246)	6/9/2022 10:42:36 AM	6/9/2022 10:52:00 AM	Fixed	0.056	0.077	284°37'38.2"	153247.197	-1061.559
ORVB --- MM21 (B250)	6/9/2022 8:32:26 AM	6/9/2022 11:10:38 AM	Fixed	0.023	0.071	287°48'47.1"	198678.420	-981.296
5B35 --- SSAC (B252)	6/13/2022 8:26:55 AM	6/13/2022 8:36:11 AM	Fixed	0.039	0.054	186°02'47.9"	34547.189	-12.723
5B35 --- U107 (B254)	6/13/2022 8:54:24 AM	6/13/2022 9:03:07 AM	Fixed	0.060	0.112	235°16'31.2"	51416.252	156.998

5B35 --- FF25 (B256)	6/13/2022 9:29:04 AM	6/13/2022 9:38:56 AM	Fixed	0.027	0.074	330°38'32.9"	33056.835	77.408
5B35 --- 1118 (B259)	6/13/2022 10:03:05 AM	6/13/2022 10:17:51 AM	Fixed	0.033	0.057	247°21'12.4"	45627.449	-0.544
P270 --- P206 (B294)	6/5/2022 4:59:42 PM	6/6/2022 4:59:12 PM	Fixed	0.013	0.035	221°14'29.1"	225132.529	971.053
P206 --- H62U (B295)	6/6/2022 8:06:12 AM	6/6/2022 3:06:27 PM	Fixed	0.011	0.047	213°04'05.3"	148826.958	804.645
P206 --- H380 (B296)	6/6/2022 10:03:42 AM	6/6/2022 1:04:27 PM	Fixed	0.025	0.069	74°52'47.0"	337388.870	-946.741
P206 --- GRAR (B297)	6/6/2022 8:46:42 AM	6/6/2022 2:10:57 PM	Fixed	0.021	0.066	57°19'10.6"	188969.290	-982.160
GRAR --- H380 (B298)	6/14/2022 9:44:57 AM	6/14/2022 12:45:12 PM	Fixed	0.021	0.057	95°09'43.5"	167242.503	35.489
H62U --- GRAR (B300)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.009	0.043	106°31'08.6"	81532.227	-177.617
P206 --- H62U (B305)	6/14/2022 7:46:12 AM	6/14/2022 2:26:27 PM	Fixed	0.008	0.037	213°04'05.3"	148826.975	804.698
P206 --- GRAR (B307)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.013	0.042	57°19'10.6"	188969.304	-982.303
P268 --- GRAR (B312)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.014	0.040	333°44'29.3"	237041.690	26.746
P268 --- P270 (B313)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.006	0.013	337°35'26.5"	303728.608	37.931
ORVB --- P270 (B315)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.005	0.013	234°20'46.6"	193426.770	-1156.212
P270 --- H62U (B316)	6/14/2022 7:46:12 AM	6/14/2022 2:26:27 PM	Fixed	0.007	0.030	236°11'59.4"	80490.335	166.404
P270 --- H380 (B317)	6/14/2022 9:44:57 AM	6/14/2022 12:45:12 PM	Fixed	0.020	0.050	115°03'38.8"	196268.659	24.277
P270 --- GRAR (B318)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.008	0.036	170°39'07.3"	69079.330	-11.192
P270 --- P336 (B319)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.004	0.014	314°25'55.3"	148242.479	981.298
P336 --- H62U (B323)	6/14/2022 7:46:12 AM	6/14/2022 2:26:27 PM	Fixed	0.008	0.033	165°03'46.1"	153581.992	-814.868
P336 --- GRAR (B325)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.013	0.037	145°30'37.4"	208016.520	-992.485
P336 --- SUTB (B326)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.010	0.027	304°26'10.6"	208591.549	-1082.166
P270 --- SUTB (B327)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.008	0.025	281°49'02.3"	67888.234	-2063.451
P268 --- SUTB (B328)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.011	0.026	169°24'25.7"	271292.575	-2101.378
ORVB --- SUTB (B330)	6/13/2022 4:59:42 PM	6/14/2022 4:59:12 PM	Fixed	0.009	0.029	35°22'32.1"	156009.449	-907.259
SUTB --- H62U (B331)	6/14/2022 7:46:12 AM	6/14/2022 2:26:27 PM	Fixed	0.015	0.065	257°02'39.9"	136936.928	-1897.056
SUTB --- H380 (B332)	6/14/2022 9:44:57 AM	6/14/2022 12:45:12 PM	Fixed	0.026	0.107	122°05'36.8"	131172.143	-2039.247
SUTB --- GRAR (B333)	6/14/2022 8:30:12 AM	6/14/2022 1:53:27 PM	Fixed	0.016	0.074	225°35'00.8"	77568.742	-2074.662
GRAR --- WHIT (B336)	6/15/2022 8:01:38 AM	6/15/2022 8:14:00 AM	Fixed	0.032	0.042	141°28'08.9"	40697.665	-1.366
GRAR --- WIRD (B338)	6/15/2022 8:34:25 AM	6/15/2022 8:44:04 AM	Fixed	0.026	0.042	199°06'07.8"	30816.846	139.636
GRAR --- PUTN (B340)	6/15/2022 9:06:02 AM	6/15/2022 9:15:13 AM	Fixed	0.027	0.063	256°12'58.4"	27442.440	136.232
GRAR --- FRES (B343)	6/15/2022 9:39:13 AM	6/15/2022 9:52:04 AM	Fixed	0.034	0.079	314°42'30.0"	54892.085	32.199
GRAR --- WIRR (B344)	6/15/2022 10:08:46 AM	6/15/2022 10:13:24 AM	Fixed	0.060	0.078	357°23'56.6"	55827.740	6.473
GRAR --- WIRR (B346)	6/15/2022 10:13:26 AM	6/15/2022 10:22:14 AM	Fixed	0.047	0.068	357°23'56.5"	55827.634	6.479
GRAR --- DRYS (B348)	6/15/2022 10:42:27 AM	6/15/2022 10:51:01 AM	Fixed	0.030	0.034	67°55'11.7"	20886.358	-7.586

Technical Memorandum

Date: 06/30/2022
To: Colusa Groundwater Authority GSA and Glenn Groundwater Authority GSA
From: Davids Engineering, Inc.
Topic: Colusa Subbasin Well Monitoring Pilot Program

1 Introduction

The Colusa Subbasin Well Monitoring Pilot Program (WMPP) is a multi-phase, incentive-based pilot program to continuously monitor groundwater levels and groundwater extraction at participating wells in the Colusa Subbasin (Subbasin). The Colusa Groundwater Authority (CGA) Groundwater Sustainability Agency (GSA) and the Glenn Groundwater Authority (GGA) GSA (hereinafter referred to as "the GSAs") have jointly implemented this program since 2021 through cooperation with interested growers and landowners. This voluntary, non-regulatory program is intended to support the GSAs in gathering information regarding groundwater levels and groundwater extraction in the Subbasin while providing participants with near-real time access to information on well production and groundwater levels at their wells to support irrigation management.

During the WMPP, the GSAs solicited voluntary participants and worked with a commercial vendor to install monitoring and telemetry equipment to continuously collect groundwater levels and groundwater extraction volumes. Since summer 2021, data has been collected, aggregated, and reported through an integrated, web-enabled monitoring network. This data is available to participants and to the GSAs, informing on-farm water management and contributing to Subbasin-wide groundwater monitoring and management under the Sustainable Groundwater Management Act (SGMA).

This technical memorandum (TM) discusses the history and development of the WMPP, reports on select data and findings from the WMPP as of June 2022, and provides conclusions and recommendations for future implementation of the WMPP.

1.1 Program Objectives

The objectives of the WMPP are to:

- Encourage stakeholder engagement/involvement in Groundwater Sustainability Plan (GSP) implementation.
- Test the functionality and practicality of the WMPP equipment for monitoring groundwater conditions in the Subbasin.
- Evaluate opportunities and benefits of using new irrigation management technologies to improve on-farm water management.
- Expand data collection and fill data gaps related to groundwater levels and groundwater extraction.

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- Evaluate the utility and feasibility of expanding the WMPP concept for Subbasin-wide implementation.

1.2 Program Funding

Funding for the WMPP has been provided in full or in part from the Water Quality, Supply, and Infrastructure Improvement Act of 2014 and the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68), and through an agreement with the California Department of Water Resources (DWR).

2 Program Design

This section describes the general design of the WMPP, including the considerations and decisions that went into development of each stage of the program. The GSAs have implemented the WMPP in two phases: Phase 1 covered initial program development, and Phase 2 covered program expansion. Each phase of WMPP implementation included the same basic stages:

- Participant Solicitation and Application Process
- Participant Selection and Agreements
- Site Preparation and Equipment Installation
- Monitoring

The following subsections are organized according to these general stages of WMPP implementation.

2.1 Participant Solicitation and Application Process

At the beginning of each WMPP phase, the GSAs conducted stakeholder outreach to notify the public about the WMPP, to solicit well owners[1] who were interested in participating, to direct interested well owners toward the WMPP application process, and to answer questions about the program. This section describes the GSAs' general efforts to engage stakeholders and to solicit participants for the WMPP.

2.1.1 Stakeholder Outreach and Solicitation

Each phase of the WMPP began with stakeholder outreach to broadly notify the public about the WMPP and to solicit potential participants. Stakeholder outreach occurred through flyers, email campaigns, social media, press releases, and an in-person workshop (Phase 1 only). **Appendix A** contains materials and information that were distributed and presented as part of the WMPP stakeholder outreach efforts in Phase 1 and Phase 2.

[1] Some active participants in the WMPP are "well users," but are not technically the "well owners." In those cases, the well owners were still required to approve the WMPP agreement. The term "well owner" is used in this TM for simplicity.

Information shared as part of stakeholder outreach efforts generally included:

- Background information about the WMPP, including its goals and objectives
- More description of the WMPP activities and requirements during each Phase, including:
    - Planned stages of WMPP implementation (application process, participant selection process, agreement process, site preparation, equipment selection and installation, and ongoing monitoring)
    - Timeline for each stage of WMPP implementation
    - Incentives
    - Site preparation and equipment requirements
    - Eligibility requirements
- Information on how to apply
- Contact information for questions and more information
- Acknowledgement of the WMPP funding source

2.1.2 Eligibility Requirements

Participants were solicited with clear communication of the following eligibility requirements. All applicants to the WMPP were aware of and agreed to these requirements.

- Participants must agree that the well location and information collected in the WMPP may be made publicly available by the GSAs.
- Participants must agree to participate in the WMPP for the duration of the term established in the agreement (a period of approximately three years).
- Participants must allow GSA representatives or authorized personnel (i.e., consultants and vendor representatives contracted by the GSAs) to make site visits to inspect wells, install monitoring and telemetry equipment, verify installation, and collect manual measurements as needed.
- Participants must install an approved flow meter per the manufacturer's specifications, if not already present.[2]
- Participants must install an access tube for the level sensor in the well casing, if not already present.
- Participants must manually report groundwater extraction (i.e., pumping) data during the three-year enrollment period, in the event of equipment failure.

2.1.3 Incentives

The GSAs created several incentives, covered by grant funds, to encourage participation in the WMPP. The GSAs stipulated that grant funds could not be paid directly to participants. These incentives cover eligible costs for equipment procurement, installation, and site preparation:

- Data logger and telemetry (fully covered)

[2] The GSAs agreed to cover the cost of an approved flow meter, up to $2,500. Approved flow meters are listed in Section 2.3, below. Some sites with mechanical meters were permitted to participate in the program through the installation of a conversion kit that allowed the meter to interact with the telemetry equipment.

- Groundwater level sensor (fully covered)
- Other monitoring and telemetry equipment (i.e., datalogger, solar panel, cellular modem; fully covered)
- Flow meter (as needed, if a flow meter must be purchased or upgraded; covered up to $2,500)
- Subscription for web and mobile access to data (three-years[3]; fully covered)

2.1.4 Application Process

During each phase of the WMPP, an application process was opened to all interested well owners in the Colusa Subbasin. Interested well owners were invited to submit a brief application containing their contact information and specific information related to the proposed well(s) that they wished to enroll in the WMPP.

The applications that were distributed during each phase of the WMPP program are included in **Appendix B**. Copies or links to these applications were communicated as part of the stakeholder outreach efforts described in Section 2.1.1. PDF copies of the applications were distributed in Phase 1 and Phase 2. In Phase 2, a web-based survey style application was also created. All applications were designed to be simple, single-page documents and easy to complete to encourage participation.

Specific information collected in each phase included:

- Contact information for the applicant
- Well location
- Acreage, crop(s), and type(s) of irrigation system(s) served by the well
- Existing equipment, including the presence of flow meter
- Water source(s) available to the field served by the well, including the estimated reliance on groundwater versus surface water

In alignment with the eligibility requirements, applicants were also required to acknowledge their willingness to share information collected as part of the WMPP, and to allow GSA representatives to visit the well site.

Applicants were permitted to submit more than one well for consideration, although each well was evaluated and screened individually. The GSAs initially chose to limit the number of participating wells to one per participant, unless additional funding remained after initial selection was complete.

[3] Phase 1 participants received a one-year paid subscription for the year between Phase 1 and Phase 2. In Phase 2, three-year subscriptions were paid for all participating sites. Program participation may be extended beyond 3 years, as mutually agreed.

2.2 Participant Selection Process and Signing Agreements

After each application period ended, the GSAs reviewed all sites that were submitted for consideration and proceeded to select a set of the highest-ranking sites that were most suitable for inclusion in the WMPP. The GSAs then proceeded to execute agreements with the selected participants. The sections below describe the criteria that were generally considered to select those sites, and the agreements that were executed with selected participants.

2.2.1 Site Selection Criteria

Following the receipt of applications during each phase of the WMPP, the GSAs reviewed all proposed sites according to a set of criteria in order to determine the relative suitability and ranking of each site for the WMPP. Sites were reviewed primarily with consideration for:

- **Location within the Subbasin:** The GSAs preferred to enroll equal numbers of participants in both Glenn and Colusa Counties, preferably across a geographically diverse area.
- **Primary water source available to fields served by the well:** The GSAs preferred fields that rely exclusively or primarily on groundwater. Those wells were expected to provide more practical information about groundwater extraction for irrigation in areas where groundwater is primarily or exclusively used, and where little or no water use data is historically available.
- **Presence of an existing flow meter installed per manufacturer specifications:** Preferred to obviate the need for additional equipment installation.
- **Site construction suitability for monitoring equipment:** The GSAs preferred wells that did not require structural changes to accommodate the monitoring and telemetry equipment.

Other considerations during review of the applications were:

- **Number of wells submitted per applicant**: The GSAs initially chose to limit the number of participating wells to one per participant, unless additional funding remained after initial selection was complete. For applicants that submitted multiple applications, the highest ranking well was included in the initial round of selection.
- **"First come, first served"**: If more than one well ranked equally, and only one could be funded, the GSAs chose to select the first application submitted to the WMPP.

2.2.2 Participant Agreements

Following the site selection process, the GSAs proceeded to execute agreements with the selected participants. Separate agreements were developed by the CGA GSA and GGA GSA to execute with participants in the Colusa County and Glenn County portions of the Colusa Subbasin, respectively. **Appendix C** contains copies of the most recent agreements that were developed by the GSAs in Phase 2 of the WMPP. All participants in the WMPP have executed an agreement with one of the GSAs. Each agreement is active from the time the agreement was signed and continuing through the end of the third year. In Phase 2, all participants have agreed to participate in the program through December 31, 2024.

2.3 Site Preparation and Equipment Installation

Certain site preparation and equipment installation was required for each participating well, as described below.

2.3.1 Site Visits and Site Preparation

Following selection, or as part of the selection process for wells in the WMPP, GSA representatives or other authorized personnel visited the site to verify site conditions and identify any site preparation measures that would be needed before installing monitoring and telemetry equipment. Information gathered during the site visits included:

- Well location (verifying the information given in the application)
- Flow meter information (presence, manufacturer, model, capacity)
- Pipe manifold information (size, suitability of configuration)
- Presence of an access tube in the well casing
- Verification of the pipe manifold size

While site suitability was one of the criteria used to select wells for the WMPP, some sites that were ultimately enrolled in the WMPP did require some reconfiguration prior to installation. For instance, some sites required flow meters to be installed – some even requiring reconfiguration of the manifold – and others required installation of an access tube for the level sensor.

2.3.2 Flow Meters

Sites were evaluated to determine whether they had an approved flow meter that would be capable of interacting with the telemetry equipment. Recommended flow meters included:

- McCrometer flow meters (https://www.mccrometer.com/Agricultural-Turf)
    - Water Specialties
    - McPropeller
- SeaMetrics flow meters (https://www.seametrics.com/applications/agriculture/)
    - AG3000
- Others, as approved by a GSA representative or other authorized personnel
    - Mechanical meters at certain sites were acceptable with a conversion kit that allowed the meter to interact with the telemetry equipment.

2.3.3 Level Sensors

Level sensors were required to be installed at all wells to allow measurement of groundwater levels. Initially, pressure transducers were recommended for installation, but after further consideration well bubblers were installed instead. Well bubblers were preferred because their smaller diameter allowed them to fit through all the existing access pipes. In addition, because the only inserted component is a flexible plastic tube, there is less risk of damage to the well pump if the site is vandalized or adjusted in the future without proper supervision. Well bubblers were installed at all participating wells.

2.3.4 Telemetry

Every well participating in the WMPP required installation of telemetry equipment to record and transmit groundwater extraction and groundwater level measurements. Components of the telemetry installation at each well included:

- Datalogger
- Solar power supply
- Cellular modem
- Online data platform

The GSAs evaluated and compared multiple commercially-available telemetry options offered by Ranch Systems, WellIntel, and Wildeye. Ultimately, the GSAs selected Ranch Systems as the telemetry provider for the WMPP based on the suitability of their telemetry equipment, their local accessibility through Colusa County Farm Supply – an authorized reseller of Ranch Systems products based in Williams, California – and the accessibility of their web-based "myRanch™" data management and visualization system.

The selected Ranch Systems telemetry equipment and features installed at each site included:

- RS130 telemetry node
- Inputs for two sensors (expandable to add others)
    - Flow meter
    - Level sensor (well bubbler)
- Optical sensor for existing mechanical meters
- Datalogger
- Solar panel
- Cellular model
- Mobile, tablet, and computer access to data through the myRanch™ system

2.3.5 Equipment Installation

Following the site visits and site preparation, as needed, all required monitoring and telemetry equipment were installed at each participating well per the manufacturer's recommendations. In Phase 1, site visits and equipment installations were conducted directly by a Ranch Systems representative. In Phase 2, site visits and equipment installations were conducted by Colusa County Farm Supply, an authorized reseller of Ranch Systems products.

2.4 Monitoring

Data collection and reporting began directly following installation of the telemetry and monitoring equipment. Data collected at each participating well is continuously logged and reported in the myRanch™ system on an instantaneous timestep, with values recorded about once a minute. The raw data available in the myRanch™ portal includes the pressure of the well bubbler, which is converted to feet, and the flow rate of the meter, which can be multiplied by time of operation to calculate the volume of groundwater extracted.

Participants have access to near-real time groundwater level and groundwater extraction data for the wells they own, and are able to use that data to inform irrigation management decisions. GSA representatives have access to all data collected across all wells in the WMPP. Reports on select data collected across all wells in the WMPP will also be generated automatically in the myRanch™ system and emailed directly to the GSA representatives on a regular basis throughout the duration of the WMPP. The GSAs may produce additional reports and queries as needed.

Beginning with enrollment of the Phase 2 wells, the WMPP provides for three years of data collection, storage, and access following execution of the participant agreements. For the wells enrolled in Phase 1, data is already available for the period between 2021-2022, and will also be available for the next three years, providing four years of data in total.

3 Program Timeline and Implementation Activities

This section provides additional information regarding implementation of the WMPP, including the timeline and notable occurrences during the program stages (described in Section 2) in Phase 1 and Phase 2 of the WMPP.

Figure 1 shows the general locations of wells that were enrolled in Phase 1 and Phase 2 of the WMPP. In total, four wells were enrolled and had equipment installed during Phase 1 of the WMPP. Data from these wells has been collected since July 2021 and will continue to be collected through December 2024. During Phase 2 of the WMPP, an additional 12 sites were enrolled and had equipment installed, expanding the WMPP to ta total of 16 sites. Data collection has just begun for the Phase 2 wells (as of June 2022), and data will continue to be collected through December 2024.

3.1 Phase 1: Initial Program Development

This section describes the timeline and activities that occurred during Phase 1 of the WMPP, during initial program development.

3.1.1 Timeline

- Participant Solicitation and Application Process: January – February 2021
    - Application Deadline: February 26, 2021
- Participant Selection Process and Signing Agreements: March – May 2021
- Site Preparation and Equipment Installation: May – July 2021
- Monitoring: July 2021 – December 2024

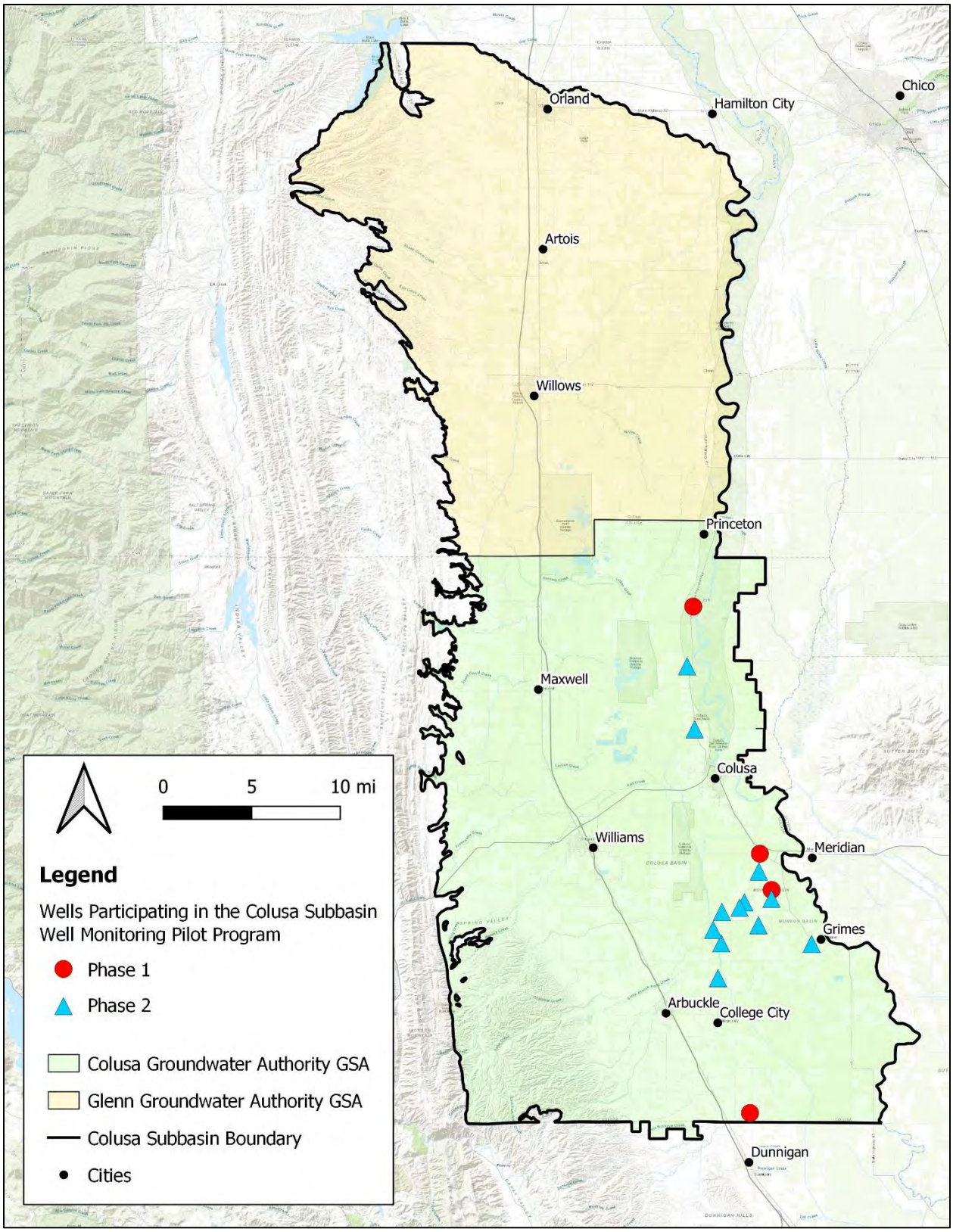

Figure 1. General Locations of Wells Participating in the Colusa Subbasin Well Monitoring Pilot Program.

3.1.2 Implementation Activities

Early discussions and initial planning for Phase 1 of the WMPP began in summer 2020, as funding was made available for implementation of a groundwater monitoring program. In consultation with the GSAs' Joint Technical Advisory Committee (TAC), GSA staff and consultants initially outlined options for groundwater monitoring, including monitoring equipment and telemetry options that could be used to economically monitor groundwater levels and groundwater extraction. During the August 2020 and October 2020 Joint TAC meetings, the GSAs began to clearly define the program structure, selection criteria, and incentive structures. Based on the input received from the GSAs' Joint TAC, the GSA staff and consultants developed a more detailed program description, a draft flyer describing the program to stakeholders, and a draft application form for potential participants. This information was reviewed and discussed with the Joint TAC in November 2020. Based on feedback received, the program description, draft flyer, and draft application were updated and prepared for release to stakeholders.

The GSAs released the WMPP flyer and began soliciting participants for Phase 1 of the WMPP in January 2021. At the same time, the GSAs planned and conducted an online workshop with growers and landowners to inform them of the WMPP, provide additional details regarding the benefits and participation requirements of the program, receive feedback and answer questions from potential participants. **Appendix A** contains copies of the Phase 1 stakeholder outreach and workshop materials from early 2021.

The participant application deadline for Phase 1 of the WMPP was February 26, 2021. **Appendix B** contains a copy of the Phase 1 application. The GSAs received a total of 21 applications to the WMPP. The GSAs reviewed those applications in March-April 2021 and identified six wells for enrollment in the WMPP. The wells were selected based on their suitability, according to the criteria described in Section 2.2.1, and based on the total amount of funding available during Phase 1 of the WMPP. Four[4] of the six selected wells were located in the Colusa County (CGA) portion of the Subbasin, and the remaining two were located in the Glenn County (GGA) portion of the Subbasin.

In May-June 2021, the GSAs sent acceptance and rejection letters to all applicants, as applicable, and conducted site visits to verify that all wells proposed for the WMPP meet the participation criteria and to specify the monitoring equipment needed at each site. Ranch Systems was selected to supply and install all necessary monitoring equipment and to provide data hosting services for the WMPP.

[4] At the time the six wells were selected, details submitted in the participants' applications suggested that three wells were located in the Colusa County portion of the Subbasin and that three wells were located in the Glenn County portion of the Subbasin, providing equal numbers of wells in both counties and GSA areas. Through later site visits, it was determined that one of the wells thought to be in Glenn County was actually in Colusa County.

As of July 2021, all monitoring equipment for Phase 1 of the WMPP was procured and the monitoring equipment had been installed at four of the six wells enrolled in the program. Ranch Systems performed the installations and continues to provide data hosting services for those sites. Groundwater level and groundwater extraction data from those four sites has been available to the GSAs and the well owners/operators since July 2021.

At the two remaining wells – both in Glenn County – installation of monitoring equipment was delayed because the land manager that was responsible for both wells was extremely busy, causing delays in response and failure to execute the participant agreements. GSA staff attempted to communicate with the land manager for several months to no avail, leading the GSAs to unenroll those two wells from the WMPP.

The GSA staff and consultants presented a status report on Phase 1 of the WMPP at the GSAs' Joint TAC meeting in August 2021. A central point was that all well owners were favorably impressed with the data and reporting system. In September 2021, Ranch Systems provided GSA staff and consultants a preview of the web-based myRanch™ data management and visualization system and granted them access to view all data collected as part of the WMPP. In October 2021, Ranch Systems also provided a demonstration of the myRanch™ system and monitoring data from the WMPP at a joint meeting of the CGA and GGA Boards. This meeting was open to the public and the meeting presentation and recording were made available on the GSA websites.

3.2 Phase 2: Program Expansion

This section describes the timeline and activities that occurred during Phase 2 of the WMPP, during program expansion.

3.2.1 Timeline

- Participant Solicitation and Application Process: February – March 2022
    - Application Deadline: March 10, 2022
- Participant Selection Process and Signing Agreements: March – May 2022
- Site Preparation and Equipment Installation: May – June 2022
- Monitoring: June 2022 – December 2024

3.2.2 Implementation Activities

Following the favorable reviews of Phase 1 by WMPP participants and stakeholders in the Colusa Subbasin, the GSAs began considering options for expanding the WMPP using available grant funds.

In September-November 2021, the GSA staff and consultants communicated with Ranch Systems and drafted a memo and budget discussing options and incremental costs for adding new sites to the WMPP during Phase 2. This information was used to support a grant amendment request prepared by GSA staff that, among other changes, allocated funding for

Phase 2 of the WMPP. The grant amendment request was submitted in December 2021, and funding was allocated in March 2022 to install monitoring equipment at up to 16 additional well sites.

In January-February 2022, the Consultant Team and GSA staff continued planning the WMPP expansion and developed a flyer to advertise Phase 2 of the WMPP. The GSAs released the flyer and began soliciting participants for Phase 2 of the WMPP in late February 2022. At the same time, the GSAs conducted outreach via email lists and social media to inform growers and landowners of the opportunity to participate in Phase 2 and provide additional details regarding the benefits and participation requirements of the program. **Appendix A** contains copies of the Phase 2 stakeholder outreach materials from 2022.

The participant application deadline for Phase 2 of the WMPP was March 10, 2022. **Appendix B** contains a copy of the Phase 2 application. The Phase 2 application was available in both a PDF format (like Phase 1) and in an online survey format. Applicants reported that the online survey was easily-accessible and significantly improved their experience completing the applications, as compared with the PDF format. Another benefit was the limited amount time GSA staff and consultants needed to compile the application information that was entered in the online format.

The GSAs received a total of 21 applications to the WMPP, some of which were later withdrawn and some of which were submitted as alternates for withdrawn wells or for wells that were found to be unsuitable for the WMPP. The majority of the applications submitted to the WMPP (18) were for wells in the Colusa County portion of the Subbasin. The GSAs reviewed the applications and ultimately identified 12 wells that were suitable for enrollment in the WMPP. The wells were selected based primarily on the site construction suitability for monitoring equipment, according to the criteria described in Section 2.2.1. All 12 wells are located in the Colusa County portion of the Subbasin. While three applications were received from well owners in the Glenn County portion of the Subbasin, those applications were later withdrawn by the well owners for various reasons.

In April-May 2022, the GSA staff and consultants initiated the process of reviewing, revising, and executing participant agreements with the 12 wells being added in Phase 2 of the WMPP. Prior to executing the agreements, Colusa County Farm Supply (with support from Ranch Systems and GSA representatives) conducted site visits at all 12 wells to ascertain the conditions at each well, verify the specific monitoring equipment needed, and determine whether each well was ready for installation or whether reconfiguration was needed first. At those wells where reconfiguration was needed, a GSA representative coordinated discussions with well owners to plan and complete those reconfigurations prior to installation.

In May-June 2022, GSA staff and consultants coordinated efforts to sign all participant agreements, and Colusa County Farm Supply completed the installation of all monitoring

equipment. Groundwater levels and groundwater extraction are being monitored at all sites as of June-July 2022.

4 WMPP Results and Preliminary Conclusions

4.1 Initial WMPP Data

Groundwater level data and groundwater extraction volumes are available for all wells enrolled in the WMPP through the Ranch Systems myRanch™ portal. The data collected as part of the WMPP is available to the growers and the GSAs on an instantaneous timestep, with values recorded about once a minute. The raw data available in the myRanch™ portal includes the pressure of the well bubbler, which is converted to feet, and the flow rate of the meter, which can be multiplied by time of operation to calculate the volume of groundwater extracted. Data is available individually for each well and can also be aggregated across all the wells in the WMPP.

Data collected during Phase 1 is summarized below. Data collected during Phase 2 will be logged in the myRanch™ portal and summarized in automated reports sent to the GSAs as that data is collected.

Figure 2 below shows the first year of groundwater level data collected for two sample wells enrolled in Phase 1 of the WMPP. Groundwater levels are shown in units of feet below the ground surface, though sea level referenced elevation is also available in the myRanch™ portal. Both measurements can be used to create groundwater contours as they convey different information. Sea level contours show the hydraulic gradient underground – the slope that water tends to move along from higher elevations to lower elevations. Below ground surface measurements and contours show the distance between the groundwater level and the ground surface, which is important for understanding pump lift and well performance. The trends seen in **Figure 2** are as expected: following the irrigation season, there is a recovery in groundwater levels over the winter from rains and a lack of irrigation demand. In the summer and early fall months the groundwater level is lower, with a rise and fall in levels expected around pumping events.

Figure 3 below shows the combined daily volume of groundwater extracted across all four wells that participated in the Phase 1 of the WMPP. The groundwater extraction data in the myRanch™ portal is reported as a flow rate, which must be time-averaged over a period and then multiplied by a time factor to calculate the volume. This figure shows the late summer and early fall pumping in 2021, followed by a period of almost no pumping from November 2021 through April 2022, with increased pumping to meet demand starting again in April 2022.

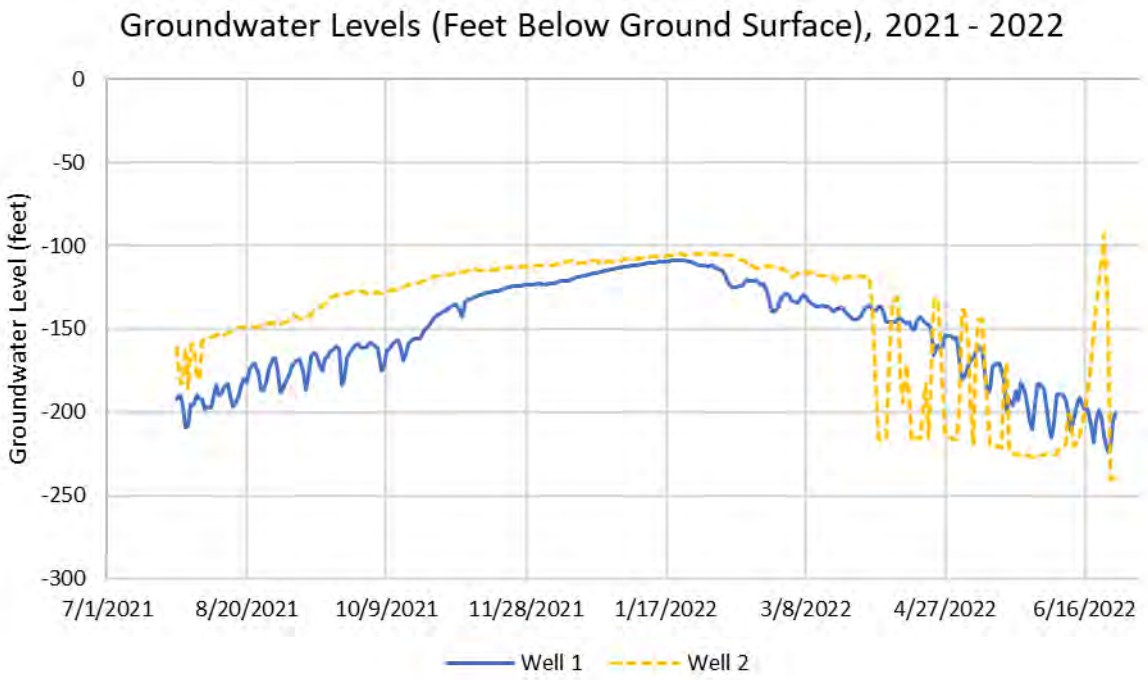

Figure 2. Groundwater levels at two sample wells from July 2021 through June 2022. The groundwater levels shown represent feet below the ground surface. The groundwater levels shown are both static (well off) and dynamic (well running), showing how the level draws down under operating conditions. Well 2 has a higher average water level, but more significant draw down than Well 1.

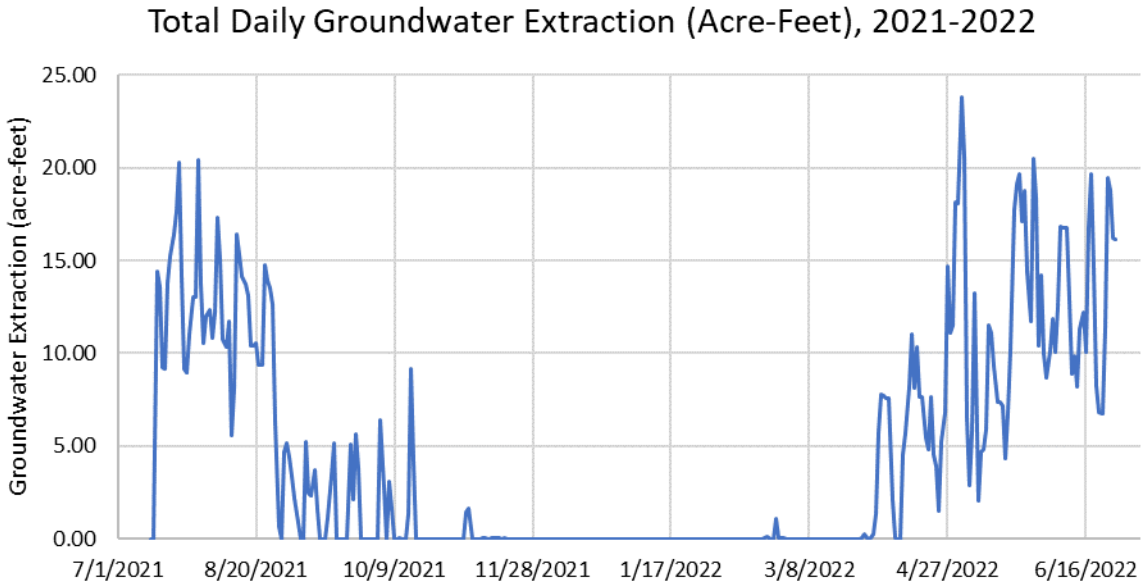

Figure 3. Total daily groundwater extraction volume (acre-feet) from July 2021 through June 2022 for all four wells enrolled in Phase 1 of the WMPP. Instantaneous data was aggregated to daily totals for the graph.

4.2 Preliminary Conclusions and Recommendations

4.2.1 Preliminary Conclusions from Phase 1 and Phase 2

Thus far, the WMPP has been well-received by participants in the Colusa Subbasin. Since the first monitoring equipment was installed in summer 2021, the Phase 1 participants have had continuous access to groundwater level and groundwater extraction data for their individual wells. Those participants that have interacted with the myRanch™ system regularly have communicated favorable opinions of its utility for supporting irrigation and on-farm water management decisions. Phase 2 participants are interested in these same benefits, but have yet to share firm conclusions since data collection has only just begun.

Notably, interest among participants has largely been in the Colusa County portion of the Colusa Subbasin. While overall outreach efforts have broadly invited well owners in both Glenn and Colusa County to participate in the program, some participating well owners in Colusa County have been most passionate about this program and have make concentrated efforts to encourage participation among other nearby well owners in Colusa County. If the WMPP is to continue expanding in the future, concentrated outreach efforts will be needed to encourage participation in Glenn County as well.

With respect to the WMPP objectives, Phase 1 and Phase 2 have successfully encouraged stakeholder engagement and involvement in GSP implementation, mostly among the participating well owners in Colusa County. Among participating well owners, the monitoring equipment and the web-based monitoring data management and visualization system have served as valuable tools for managing irrigation and monitoring local groundwater conditions.

From the perspective of the GSAs, the WMPP has also provided valuable insights into localized groundwater conditions in Colusa County, although it is noted that since the inception of the WMPP other publicly-accessible data tools created by DWR (California's Groundwater Live, the SGMA Data Portal, etc.) have provided the GSAs with a greater perspective on localized groundwater conditions Subbasin-wide. Nevertheless, the WMPP has successfully expanded data collection to fill data gaps related to groundwater levels and groundwater extraction in the areas of the Colusa Subbasin where well owners have participated.

4.2.2 Considerations and Preliminary Recommendations for Subbasin-wide Monitoring

Reflecting on Phase 1 and Phase 2, the WMPP concept does provide benefits to monitoring groundwater levels, but it is unclear that expanding the WMPP concept for Subbasin-wide monitoring would be practical compared to other alternatives for monitoring groundwater extraction. During the WMPP, participation among well owners was difficult to secure, and largely came as the result of focused outreach by existing participants to other nearby well owners in Colusa County. If Subbasin-wide monitoring is desired, focused outreach to individual well owners Subbasin-wide would likely be needed, and the GSAs would doubtless need to change from a voluntary program to a mandatory program. Each part of that transition would

require significant time and resources to conduct more outreach and address well owners' concerns about monitoring and reporting their groundwater extraction.

Beyond the costs of outreach, the estimated equipment costs for expanding the WMPP Subbasin-wide are approximately $18 million[5] or more, depending on the total number of wells that will need to be enrolled in the WMPP and the future costs of monitoring equipment required for each site. This total likely underestimates the total costs of equipment; although some savings may be achieved through efficiencies of scale, there may be more wells to enroll than initially anticipated (the number of wells considered in this estimate only includes agricultural wells with well completion reports that have been submitted to DWR since 1970) and it is likely that the near-term costs of monitoring equipment will increase. These costs also exclude the costs of data plans and any necessary site reconfigurations needed to properly install monitoring equipment.

As an alternative to the WMPP concept, GSA staff and representatives have discussed opportunities for monitoring groundwater extraction Subbasin-wide using remote sensing approaches. Approaches to estimate actual groundwater extraction using satellite data and model-derived estimates of consumptive water use are currently being investigated in several other subbasins across California. These approaches introduce other challenges – especially concerns from landowners about their accuracy – but they do generally offer a more economical solution for quantifying groundwater extraction over large spatial areas. Grower outreach is still critically important for successfully implementing these remote sensing approaches, but the GSAs would have the ability to monitor water use in all areas of the Subbasin, regardless of each individual grower's responsiveness and cooperation. For these reasons, a remote sensing approach may be a more suitable option for future monitoring of groundwater extraction across the entire Colusa Subbasin.

Still, for remote sensing approaches to function accurately, the GSAs will need to validate estimated groundwater extraction results against actual measurements of groundwater extraction across a diverse range of crops and areas in the Colusa Subbasin. Validation is one role that the WMPP approach can play to complement other methods for quantifying groundwater extraction Subbasin-wide. Additionally, some landowners may remain skeptical of the results of remote sensing approaches and seek other options for monitoring and reporting their groundwater extraction. To address those concerns, the WMPP concept may function as one part of a comprehensive Subbasin-wide program to monitor groundwater extraction.

[5] Estimated total equipment cost is calculated based on the approximate number of agricultural wells in the Colusa Subbasin reported from Well Completion Reports (approximately 2,600 total, per Section 2.1.2.4 of the Colusa Subbasin GSP) and the approximate per-site equipment costs (approximately $7,000 per site as of 2022, excluding data plan costs).

Appendix A. Stakeholder Outreach Materials

Stakeholder Outreach and Participant Solicitation for Phase 1 (2021)

- Flyer
- Press Release
- Workshop Outreach
- Workshop Agenda
- Workshop Presentation

Stakeholder Outreach and Participant Solicitation for Phase 2 (2022)

- Flyer
- Social Media Outreach

Stakeholder Outreach and Participant Solicitation for Phase 1 (2021)

- Flyer
- Press Release
- Workshop Outreach
- Workshop Agenda
- Workshop Presentation

Flyer – 2021

COLUSA SUBBASIN

Colusa Subbasin Well Monitoring Pilot Program

Participant Information Form

BACKGROUND

The Colusa Subbasin Groundwater Sustainability Agencies (GSAs) are implementing an incentive-based pilot program to work with interested growers and landowners to continuously monitor groundwater use and water levels at participating wells. This voluntary, non-regulatory program is intended to support the GSAs in gathering information regarding groundwater use in the subbasin while providing participants with near-real time access to information on well production and groundwater levels at their wells to support irrigation management.

PROGRAM DESCRIPTION

Activities

Interested parties are invited to submit a brief application describing contact information, location, cropping, and other information related to the proposed groundwater well. Following the receipt of applications, participants will be selected considering certain criteria. Participants agree that the well location and information collected may be made publicly available. Participants also agree that GSA representatives may make site visits to inspect wells, verify installation, and collect manual measurements as needed.

Incentives

The program will cover the purchase cost of a flowmeter or upgrades to an existing flow meter (up to $2,500), if needed, purchase and installation of a pressure transducer (to monitor groundwater levels), datalogger, solar panel, cellular modem, and a 3-year subscription for web and mobile access to data gathered. Program participation may be extended beyond 3 years, as mutually agreed.

Participants will be responsible for:

- Installation of flow meter per manufacturer specifications
- Installation of access tube for pressure transducer in well casing
- Monthly cellular modem costs (approx. $15 per month)
- Manual reporting of pumping data, in the event of device failure

Timeline

- **January 2021:** Applications Accepted
- **February – March 2021:** Participants Selected, Agreements Executed, Wells Inspected, and Equipment Installed
- **April 2021 – October 2023:** Wells Monitored

Funding for this project has been provided in full or in part from the Water Quality, Supply, and Infrastructure Improvement Act of 2014 and the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68), and through an agreement with the State Department of Water Resources.

QUESTIONS?

For more information, please contact:

Colusa Groundwater Authority
Mary Fahey, CGA Program Manager
530-458-0719 • mfahey@countyofcolusa.com

Glenn Groundwater Authority
Lisa Hunter, GGA Program Manager
530-934-6540 • lhunter@countyofglenn.net

Press Release – 2021

COLUSA SUBBASIN

FOR IMMEDIATE RELEASE

Mary Fahey
Program Manager
Colusa Groundwater Authority
mfahey@countyofcolusa.org
530-458-0719
https://colusagroundwater.org/

Lisa Hunter
Program Manager
Glenn Groundwater Authority
LHunter@countyofglenn.net
530-934-6540
https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/glenn-groundwater-authority

Well Monitoring Pilot Program Public Workshop

The Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA) will host an evening online workshop on January 25, 2021. The purpose is to engage and inform growers and landowners who may want to in participate in a Well Monitoring Pilot Program (Pilot Program). This voluntary, non-regulatory program will support gather information about groundwater use in the Colusa Subbasin. It will provide participants near-real time access to information on production and groundwater levels at their wells as a way to support their irrigation management. Interested growers and landowners will work with the CGA and GGA to continuously monitor groundwater use and water levels at participating wells. Funding comes from the *Water Quality, Supply, and Infrastructure Improvement Act of 2014* and the *California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68),* and through an agreement with the California Department of Water Resources

During this workshop, the CGA and GGA will:

- Provide an overview of the Pilot Program
- Describe incentives and responsibilities for interested participants
- Review the application process
- Describe selection criteria for applications received, and
- Answer questions about the Pilot Program

"This is really a win-win for us" said Colusa County Supervisor Denise Carter, Chair of the CGA. "We're required to have the best information to ensure our Groundwater Sustainability Plan is approved and that we can manage our resources locally and avoid State intervention. Many of our neighbors could also really benefit from new technologies to better manage their irrigation sources. This Program gets us both of these."

Workshop Outreach – 2021

COLUSA SUBBASIN

FOR IMMEDIATE RELEASE

Mary Fahey
Program Manager
Colusa Groundwater Authority
mfahey@countyofcolusa.org
530-458-0719
https://colusagroundwater.org/

Lisa Hunter
Program Manager
Glenn Groundwater Authority
LHunter@countyofglenn.net
530-934-6540
https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/glenn-groundwater-authority

Well Monitoring Pilot Program Public Workshop

The Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA) will host an online workshop on January 25, 2021. The purpose is to engage and inform growers and landowners who may want to participate in a Well Monitoring Pilot Program (Pilot Program). This voluntary, non-regulatory program will gather information about groundwater use in the Colusa Subbasin. It will provide participants near-real-time access to information on production and groundwater levels at their wells as a way to support their irrigation management. Interested growers and landowners will work with the CGA and GGA to continuously monitor groundwater use and water levels for three years at participating wells starting prior to the 2021 growing season. Funding is provided through the *Water Quality, Supply, and Infrastructure Improvement Act of 2014* and the *California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68)* administered by the CGA through an agreement with the California Department of Water Resources.

During this workshop, the CGA and GGA will:

- Provide an overview of the Pilot Program
- Describe incentives and responsibilities for interested participants
- Review the application process
- Describe selection criteria for applications received, and
- Answer questions about the Pilot Program

"This is really a win-win for us" said Jim Wallace, Director with the CGA. "We're required to have the best information to ensure our Groundwater Sustainability Plan is approved and that we can manage our resources locally and avoid State intervention. Many of our neighbors could also really benefit from new technologies to better manage their irrigation sources. This Program gets us both of these."

Meeting Date, Time, and Attendance Information:

January 25, 2021
4:00 p.m. – 5:30 p.m.
https://csus.zoom.us/j/82557753022?pwd=aVBOQTArVGc3WkYwL3h1SWFLMk85QT09
Meeting ID: 825 5775 3022 | **Passcode:** 880156
One tap mobile: +16699006833,,82557753022#

Workshop Agenda – 2021

COLUSA SUBBASIN

COLUSA SUBBASIN WORKSHOP
WELL MONITORING PILOT PROGRAM

Hosted by the Colusa Groundwater Authority (CGA) and Glenn Groundwater Authority (GGA)

January 25, 2021
4:00 p.m. – 5:30 p.m.

This workshop will be held remotely via Zoom:
https://csus.zoom.us/j/82557753022?pwd=aVBOQTArVGc3WkYwL3h1SWFLMk85QT09
Meeting ID: 825 5775 3022 | **Passcode:** 880156
One tap mobile: +16699006833,,82557753022#

1. **Log On / Sign In**
2. **Welcome, Agenda Review, Online Meeting Instructions**
3. **Overview and Funding**
4. **Program Objectives**
5. **Program Activities and Timeline**
6. **Eligibility Criteria and Selection Process**
7. **Next Steps**
8. **Questions and Discussion**

For more information, please contact:

Colusa Groundwater Authority
mfahey@countyofcolusa.org
530-383-4625
https://colusagroundwater.org/

Glenn Groundwater Authority
LHunter@countyofglenn.net
530-934-6540
https://www.countyofglenn.net/dept/planning-community-development-services/water-resources/glenn-groundwater-authority

Workshop Presentation – 2021

COLUSA AND GLENN GROUNDWATER AUTHORITIES

Colusa Subbasin

Well Monitoring Pilot Program

January 25, 2021

1

Well Monitoring Pilot Program

- Program Overview and Funding
- Program Objectives
- Program Activities and Timeline
- Eligibility Criteria and Selection Process
- Next Steps
- Questions and Discussion

2

Overview and Funding

- Overview
  - Collect Groundwater Extraction Volumes
  - Collect Water Levels
- Current Funding
  - Funded through DWR Proposition 68 Grant
  - Estimated Budget ~$66k*

3

Program Objectives

- Encourage Stakeholder Engagement/Involvement in Groundwater Sustainability Plan (GSP) Development
- Test Program Design and Equipment
- Learn about Irrigation Management Technologies
- Incorporate Available Data into GSP Development
- Identify and Evaluate Options for Basin-Wide Implementation

4

Program Activities and Timeline

- Application and Selection: January – March
  - Application Deadline: February 26, 2021
- Participant Agreement: March – April
- Deployment: March – April
- Monitoring: Three years following deployment

5

Flow Meters

- McCrometer
  - Water Specialties
  - McPropeller
- SeaMetrics
  - Ag3000
- Others, As Approved

6

Telemetry

- Components
  - Datalogger
  - Solar power supply
  - Cellular modem
  - Online data platform
- Provider
  - Ranch Systems (www.ranchsystems.com)
  - Others, as approved

7

Ranch Systems (www.ranchsystems.com)

- RS130 Telemetry Node
- Two Input Sensors
  - Flow Meter
  - Pressure Transducer
  - Expandable to Add Others
- Optical Sensor for Existing Mechanical Meters
- Mobile, Tablet, and Computer Access

8

Incentives

- Eligible Costs
  - –Data Logger and Telemetry
  - –Pressure Transducers
  - –Flow Meters (up to $2,500)
- Grant Funds Cannot Be Paid to Participants Directly

1/25/2021 Well Monitoring Pilot Program 9

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Eligibility Requirements

- Potential Participants Agree to:
  - – Allow Groundwater Sustainability Agencies (GSAs) to make information collected publicly available
  - – Allow GSA representatives to make site visits
  - – Participate for a period of three years

1/25/2021 Well Monitoring Pilot Program 10

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Eligibility Requirements (continued)

- Potential Participants Agree to:
  - Install approved flow meter and access tube for pressure transducer in well casing, if not already present
  - Maintain cellular service for monitoring equipment telemetry during three-year enrollment period (~$15/month)
  - Manually report pumping data during three-year enrollment period, in the event of device failure

11

Selection Criteria

- Selection will Consider
  - Location within the subbasin (desire to enroll participants in both Glenn and Colusa counties)
  - Presence of an existing flow meter installed per manufacturer specifications
  - Water source (fields relying primarily on groundwater preferred)
- Other Considerations
  - Number of wells per participant
  - First come – first served

12

Other Considerations

- Number of Wells per Participant
  - Limit to one well per participant, unless funding remains after initial selection is complete
  - For participants submitting multiple applications, highest scoring well included in initial round of selection
- First Come – First Served
  - If more than one well has the same score, and only one can be funded, select first application submitted

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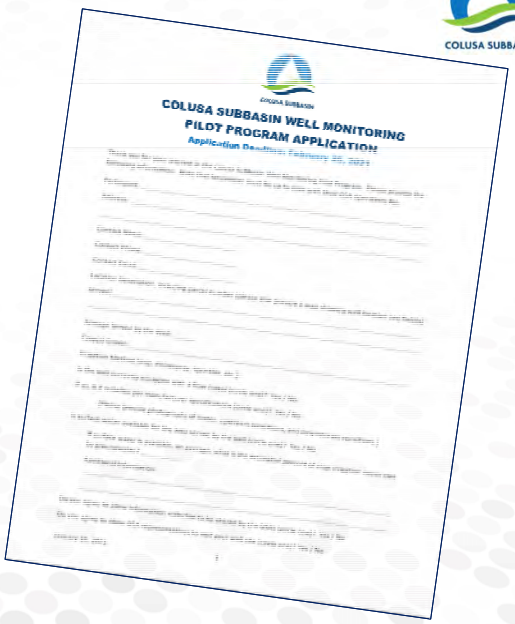
Informational Flyer

- Background
- Program Description
  - Activities
  - Incentives
  - Equipment Providers
  - Timeline
- Contact Info. for Questions
- Funding Acknowledgement

14

Participant Application

- Simple, 1-Page
- Information Requested
  - Applicant Contact
  - Location
  - Acreage, Crop(s) Served, Irrigation Method
  - Presence of Flow Meter
  - Estimate of Relative Reliance on Groundwater vs. Surface Water
  - Willingness to Share Information Collected
- Participant Agreement under Development


COLUSA SUBBASIN WELL MONITORING
PILOT PROGRAM APPLICATION

1/25/2021 Well Monitoring Pilot Program 15

15

Next Steps and Contact Information

- Application, Selection, and Enrollment
- Equipment Deployment
- Initiate Monitoring Activities

- GSA Contacts
  - Colusa Groundwater Authority: Mary Fahey, Program Manager
    - (530) 383-4625 ; Mfahey@countyofcolusa.com
  - Glenn Groundwater Authority: Lisa Hunter, Program Manager
    - (530) 934-6540; Lhunter@countyofglenn.net

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16

Questions and Discussion

17

Stakeholder Outreach and Participant Solicitation for Phase 2 (2022)

- Flyer
- Social Media Outreach

Flyer – 2022

COLUSA SUBBASIN

Colusa Subbasin Well Monitoring Pilot Program

Participant Information Form

BACKGROUND

The Colusa Subbasin Groundwater Sustainability Agencies (GSAs) are implementing an incentive-based pilot program to work with interested growers and landowners to continuously monitor groundwater use and water levels at participating wells. This voluntary, non-regulatory program is intended to support the GSAs in gathering information regarding groundwater use in the subbasin while providing participants with near-real time access to information on well production and groundwater levels at their wells to support irrigation management.

PROGRAM DESCRIPTION

Activities

Interested parties are invited to submit a brief application describing contact information, location, cropping, and other information related to the proposed groundwater well. Following the receipt of applications, participants will be selected considering certain criteria. Participants agree that the well location and information collected may be made publicly available. Participants also agree that GSA representatives may make site visits to inspect wells, verify installation, and collect manual measurements as needed.

Incentives

The program will cover the purchase cost of a flowmeter or upgrades to an existing flow meter (up to $2,500), if needed, purchase and installation of a level sensor (to monitor groundwater levels), datalogger, solar panel, cellular modem, and 50 % of a 3-year subscription for web and mobile access to data gathered. Program participation may be extended beyond 3 years, as mutually agreed.

Participants will be responsible for:

- Installation of flow meter per manufacturer specifications
- Installation of access tube for level sensor in well casing, as needed
- 50% of a 3-year subscription for web and mobile data access (full payment at beginning of program, averages to approx. $15 per month)
- Manual reporting of pumping data, in the event of device failure

Timeline

- **February - March 2022:** Applications Accepted
- **March - May 2022:** Participants Selected, Agreements Executed, Wells Inspected, and Equipment Installed
- **June 2022 - December 2024:** Wells Monitored

Funding for this project has been provided in full or in part from the Water Quality, Supply, and Infrastructure Improvement Act of 2014 and the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68), and through an agreement with the State Department of Water Resources.

QUESTIONS?

For more information, please contact:

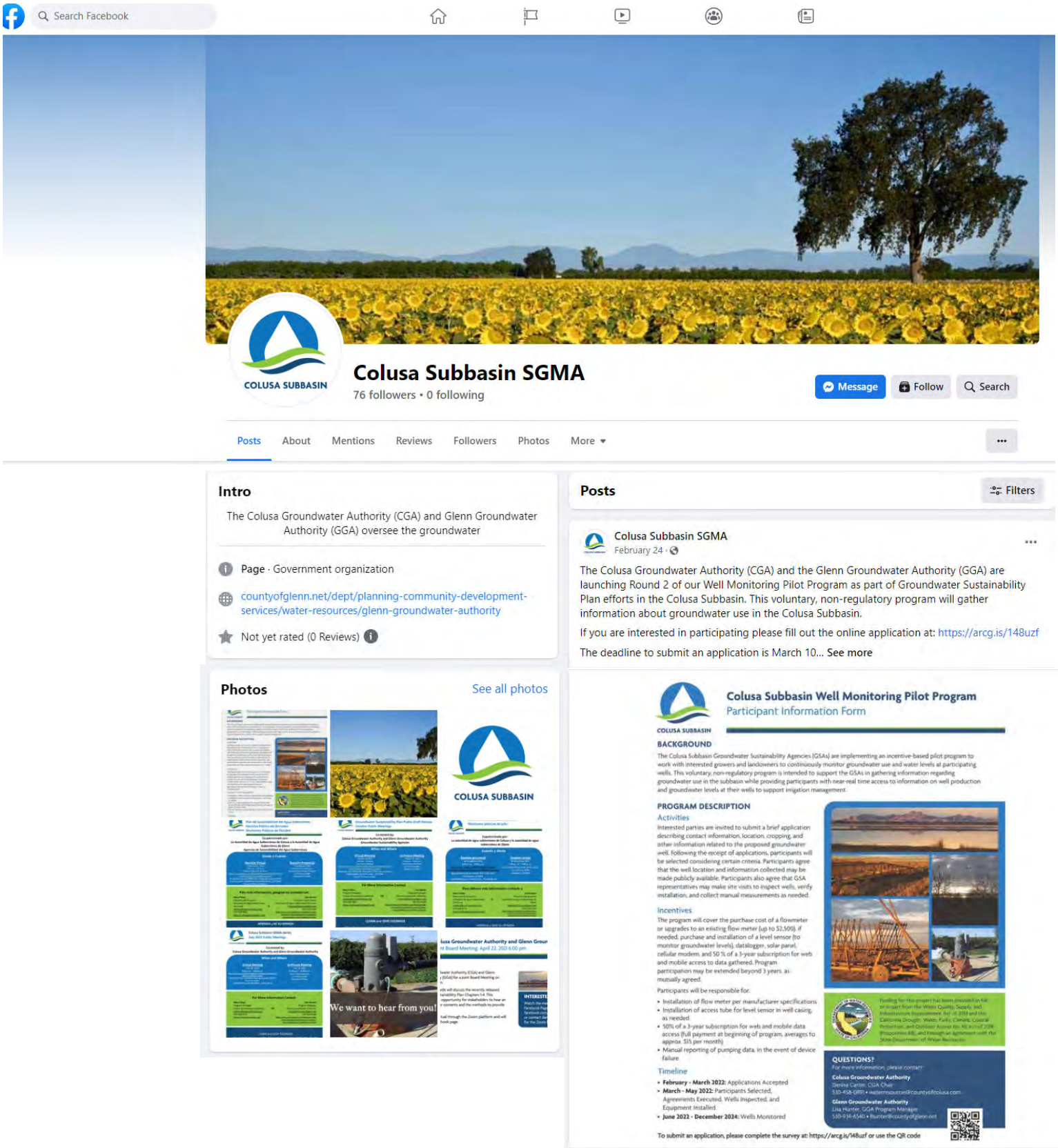
Colusa Groundwater Authority
Denise Carter, CGA Chair
530-458-0891 • waterresources@countyofcolusa.com

Glenn Groundwater Authority
Lisa Hunter, GGA Program Manager
530-934-6540 • lhunter@countyofglenn.net

To submit an application, please complete the survey at: https://arcg.is/148uzf or use the QR code

Social Media Outreach – 2022

https://www.facebook.com/ColusaSubbasin



Appendix B. Application Materials

- Application for Phase 1 (2021)
- Application for Phase 2 (2022)

Application for Phase 1 (2021)

COLUSA SUBBASIN

COLUSA SUBBASIN WELL MONITORING PILOT PROGRAM APPLICATION

Application Deadline: February 26, 2021

Thank you for your interest in the Colusa Subbasin Well Monitoring Pilot Program. Please provide the following information. Note that landowner must be up to date with their GSA operations fee. For wells in Colusa County, please submit applications via email or post to Mary Fahey, Program Manager, Colusa Groundwater Authority, 100 Sunrise Blvd., Suite A, Colusa CA 95932 (Mfahey@countyofcolusa.com). For wells in Glenn County, please submit applications via email or post to Lisa Hunter, Program Manager, Glenn Groundwater Authority, 225 N Tehama St., Willows, CA 95988 (Lhunter@countyofglenn.net).

If more space is needed for any items, please use back of application.

Participant: _____

Address: _____

Contact Name: _____ Contact Phone: _____

Contact Email: _____

Location Description, including parcel number(s) (please also provide a map showing well location and field(s) served):_____

_____

Acreage Served by the Well: _____

Crop(s) Grown: _____

Irrigation Method (drip, microspray, sprinkler, etc.):

Is the well currently equipped with a flow meter (circle one)? Yes / No.

If so, is it installed per manufacturer specifications (circle one)? Yes / No.

(Please provide photographs of meter, upstream conditions, and downstream conditions.)

Is surface water available for the area served by the well (circle one)? Yes / No

If surface water is available, on average, what is the estimated percent of crop irrigation needs met by groundwater? _____

Additional Information:

_____

_____

Do you agree to allow information collected to be shared by the GSAs (circle one)? Yes / No

Do you agree to allow GSA representatives to visit your well site (circle one)? Yes / No

Application for Phase 2 (2022)

COLUSA SUBBASIN

COLUSA SUBBASIN WELL MONITORING PILOT PROGRAM APPLICATION

Application Deadline: March 10, 2022

Thank you for your interest in the Colusa Subbasin Well Monitoring Pilot Program. Please provide the following information. Note that participating landowners must be up-to-date with their GSA operations fee and must enter into an agreement with the GSA if approved for the Program. For wells in Colusa County, please submit applications via email or post to Denise Carter, Colusa Groundwater Authority Chair, 1213 Market Street, Colusa CA 95932 (waterresources@countyofcolusa.com). For wells in Glenn County, please submit applications via email or post to Lisa Hunter, Program Manager, Glenn Groundwater Authority, 225 North Tehama Street, Willows, CA 95988 (Lhunter@countyofglenn.net).

Participant Name:_____

Participant Address:_____

Contact Name: _____ Contact Phone: _____

Contact Email: _____

Location of well, including parcel number(s) (please also provide a map showing well location and field(s) served): _____

_____

Acreage Served by the Well: _____ Crop(s) Grown: _____

Irrigation Method (drip, microspray, sprinkler, etc.): _____

Is the well currently equipped with a flow meter (circle one)? Yes / No

If so, is it installed per manufacturer specifications (circle one)? Yes / No

(Please provide photographs of meter, upstream conditions, and downstream conditions.)

Is surface water available for the area served by the well (circle one)? Yes / No

If surface water is available, on average, what is the estimated percent of crop irrigation needs met by groundwater? _____

Additional Information:

_____

_____

Do you agree to allow information collected to be shared by the GSAs (circle one)? Yes / No

Do you agree to allow GSA representatives to visit your well site (circle one)? Yes / No

Reset

Colusa Subbasin Well Monitoring Pilot Program Application

Thank you for your interest in the Colusa Subbasin Well Monitoring Pilot Program. Please provide the following information. Note that landowner must be up to date with their GSA operations fee and must enter into an agreement with the GSA if approved for the Program. If you have questions or need help completing the application, please contact Lisa Hunter, Glenn Groundwater Authority Program Manager at LHunter@countyofglenn.net.

Colusa Subbasin Well Monitoring Pilot Program: Round 2

Application Deadline: March 10, 2022

Participant Name:*

Property owner or entity name

Participant Address:*

Address of the property owner

Contact Name*

Name of person to be contacted

Contact Phone Number*

Phone number of the person to be contacted.

( ) -

Reset

Contact Email

Email of the person to be contacted

Location of Well- Parcel Number

Parcel number where well is located

- -

Location of Well

Click the location of the well

Fields Served by Well

Draw a shape around the fields served by the well.
Click the "Area" icon in upper right corner of map. Then click points around the field(s).

Reset

Acreage Served by the Well

How many acres are served by the well?

123

Crop(s) Grown

What crops are grown in the area services by the well?

- [ ] Orchard
- [ ] Rice
- [ ] Row Crops/Field Crops
- [ ] Pasture
- [ ] Grain and Hay
- [ ] Other

Reset

Irrigation Method

What irrigation method is used on ground serviced by the well?

- [ ] Drip
- [ ] Microspray
- [ ] Sprinkler
- [ ] Flood
- [ ] Other

Flow Meter

Is the well currently equipped with a flow meter

- ( ) Yes
- ( ) No

Is surface water available for the area served by the well?

- ( ) Yes
- ( ) No

Additional Attachments:

Please upload additional information that may be useful. This could also include the Round 1 application.

1 Select file (maximum number of files allowed: 10, support: pdf, doc, docx, xls, xlsx, pptx, ppt, txt)

Reset

I agree to allow information collected to be shared by the GSAs.

- ○ Yes
- ○ No

I agree to allow GSA representatives to visit my well site.

- ○ Yes
- ○ No

Date Submitted

5/13/2022

Time Submitted*

08:59 AM

Submit

Powered by ArcGIS Survey123

Appendix C. Well Monitoring Pilot Program Participation Agreements

- Colusa Groundwater Authority Groundwater Sustainability Agency Agreement (Updated for Phase 2)
- Glenn Groundwater Authority Groundwater Sustainability Agency Agreement (Updated for Phase 2)

Colusa Groundwater Authority Groundwater Sustainability Agency Agreement (Updated for Phase 2)

AGREEMENT FOR WELL MONITORING PROGRAM

This agreement ("Agreement") is made as of _____, by and between

_____ ("Cooperator"), having an address of

_____ ,
and the Colusa Groundwater Authority Groundwater Sustainability Agency ("GSA"), having an address of 1213 Market Street, Colusa CA 95932.

BACKGROUND

The GSA is implementing an incentive-based pilot program to work with growers and landowners to continuously monitor groundwater use and water levels at participating wells ("Well Monitoring Program"). This voluntary, non-regulatory program is intended to support the GSA in gathering information regarding groundwater use in the Colusa Subbasin while providing participants with near-real time access to information on well production and groundwater levels at their wells to support irrigation management. This program is being funded through a Proposition 68 Sustainable Groundwater Management grant (the "Grant Agreement") from the California Department of Water Resources (the "State"). Under the terms of this Agreement, the GSA will cover the primary costs of monitoring well production and groundwater levels, including the cost of a new or upgraded flow meter (as needed) and level sensor, a datalogger, a solar panel, and a cellular modem. The GSA will also cover 50% of the cost of a 3-year subscription to web and mobile access for the data gathered. The Cooperator will be responsible for equipment installation and maintenance, as well as 50% of the cost of a 3-year subscription for web and mobile data access (full payment at the beginning of the program). Program participation may be extended beyond three years, as mutually agreed by the Cooperator and the GSA.

TERMS AND CONDITIONS

Cooperator and the GSA agree to the following terms and conditions:

1. Term of Agreement

This Agreement will commence on the date last signed below (the "Commencement Date") and will expire on December 31, 2024 (the "Expiration Date"). Upon such expiration, the parties will have no further rights or obligations under this Agreement, except as specifically provided in this Agreement.

2. Well Monitoring Program Provision Requirements

    a. Site Preparation. The Cooperator will provide an access tube for the level sensor in the well casing, as needed, as well as an appropriate site for the flow meter and the solar panel.

    b. Equipment Specifications. The GSA agrees to provide the Cooperator with a McCrometer or SeaMetrics flow meter, or other flow meter as approved by the GSA. The GSA agrees to provide the Cooperator with a datalogger, solar panel, and telemetry sourced by Ranch Systems.

c. Equipment Installation. The Cooperator agrees to install the provided flow meter, level sensor, and telemetry equipment (including, but not limited to the data logger, solar panel, and cellular modem) and begin data collection within 30 days of receiving the equipment. If upgrades are being made to existing flow meters or sensors, the Cooperator agrees to complete upgrades and commence data collection no later than 30 days after receiving the telemetry equipment. The Cooperator agrees to install all equipment in compliance with manufacturer specification.

d. Cooperator Responsibilities – Equipment and Data. The Cooperator agrees to maintain the equipment in good, working order. In the event of a device failure, the Cooperator agrees to notify the GSA and manually report their pumping data. Pumping data must be reported as monthly volume from the flow meter totalizer. If the flow meter totalizer fails, pumping data must be reported as monthly hours of pumping. Manual data must be reported using the form in Exhibit A and submitted via email, mail, or fax to the GSA. The Cooperator is responsible for maintaining the data record until the GSA has confirmed that they have received the data automatically following any corrective actions required.

e. Responsibilities – Telemetry. The GSA and the Cooperator agree to each pay 50% of the cost for a 3-year subscription for web and mobile access to Ranch Systems. Full payment is due at the beginning of the program.

3. Access to Property, Duty of Care

Cooperator hereby irrevocably grants the GSA and its employees, funders, guests, invitees, subcontractors, agents and assigns permission to enter the Property to inspect wells, verify installation, and collect manual measurements as needed on the Property until the Expiration Date. The GSA or its representative will provide Cooperator with at least 24 hours' notice prior to entering the Property unless Cooperator agrees to a shorter notice period. Notice under this section may be provided verbally or in writing, including by text, email or fax.

During the term of this Agreement, Cooperator and the GSA agree that: (a) the GSA and its employees, funders, guests, invitees, subcontractors, agents and assigns will coordinate their activities with Cooperator in order not to unreasonably disturb ongoing maintenance operations and other farm activities on the Property or on Cooperator's adjacent property, if applicable; (b) Cooperator will comply with all federal, state, and local laws and regulations and any contractual obligations relating to the use of the Property; and (c) Cooperator will take, use, provide and make proper, necessary and sufficient precautions, safeguards and protections against the occurrence of any accidents, injuries or damages to any person or the Property.

4. Payment Terms; Termination

If the terms of this Agreement have been met and there has been no material breach of this Agreement by Cooperator, the GSA fund the cost of purchasing or upgrading the flow meter (up to $2,500) and level sensor. The GSA will also fund the cost of the telemetry installation (including datalogger, solar panel, and cellular modem). The GSA and Cooperator will each pay 50% of the cost of Ranch Systems web and mobile data access for three years. No payments will be made by the GSA to the Cooperator. The GSA will not cover costs for labor for installation, repair, or data collection. If the Cooperator breaches in any material respect any of the terms of this Agreement, then the GSA may

terminate this Agreement and, upon such termination, neither party will have any further obligation or liability to one another under this Agreement, except as provided in Sections 7, 8, 9 and 14.

5. Force Majeure

The failure of either party to perform any obligation otherwise due solely as a result of (a) governmental action, laws, orders, regulations, directions or requests, or (b) as a result of events, such as war, acts of public enemies, strikes or other labor disturbances, fires, floods, acts of God or any causes of like kind beyond the reasonable control of such party (collectively referred to as “Force Majeure"), is excused for so long as such Force Majeure exists or until the parties agree to terminate this Agreement.

6. Property Management and Notification of Changes in Operation, Lease or Ownership

During the term of this Agreement, Cooperator and Cooperator’s representatives and assigns (including all subcontractors and lessees) will manage the Property in accordance with this Agreement and so as not to disturb the nature of this project.

Cooperator intends to maintain title or a valid leasehold interest in the Property for the duration of the Agreement and will promptly notify the GSA of any planned or pending changes in operation, lease or ownership of the Property.

No exercise of the rights granted herein will give rise to any claim of title to the Property on the part of the GSA or parties claiming through or under them. This Agreement and the rights granted herein may not be assigned, in whole or in part, by Cooperator without the written consent of the GSA.

7. Cooperator’s Representations and Warranties

Cooperator represents and warrants that: (a) it has the power and authority to enter into this Agreement and to perform the actions contemplated hereunder, (b) it has obtained all consents necessary for its participation in the Well Monitoring Program and its performance of the terms of this Agreement (including without limitation the consents of any landowners and any persons with other rights with respect to the Property) (such consents, the “Consents”), (c) it has provided the GSA with a written description of all Consents, and (d) no other agreements or obligations concerning the Property interfere with Cooperator’s right or ability to perform its obligations hereunder or will be violated by Cooperator’s performance of such obligations. Cooperator further represents and warrants that Cooperator has conducted its own review of its participation in the Well Monitoring Program and its taking of or omission of actions required by or related to this Agreement, that, except as expressly provided in this Agreement, neither the GSA nor any person affiliated with or otherwise on behalf of the GSA is making or has made any representation or warranty, written or oral, with respect to the Well Monitoring Program or otherwise, and that Cooperator has not relied and will not rely on any such representation or warranty or any omissions by any such persons whether made on, before or after the date hereof, except as expressly set forth in this Agreement.

Without limiting the foregoing, if the Property is owned by any person (the “Landowner”) other than Cooperator, then Cooperator represents and warrants that Cooperator has the right to execute and perform this Agreement with respect to the Property, without the consent of the Landowner (except for any consent as Cooperator may already have obtained and which is irrevocable with respect to Cooperator’s participation in the Well Monitoring Program), and that the Landowner will not have any rights against the GSA in respect of Cooperator’s performance under or in any way related to this

Agreement and Cooperator's participation in the Well Monitoring Program. At the request of the GSA, Cooperator will arrange for a meeting of the GSA with the Landowner.

This Section 7 will survive the termination or expiration of this Agreement or any part thereof.

8. Indemnification

Cooperator assumes the risk of any damage caused by its participation in the Well Monitoring Program. Cooperator will indemnify, defend and hold harmless the GSA, its affiliates and funders and their officers, directors, members, employees and agents from and against any and all claims, demands, causes of action, damages, judgments, losses, liabilities, costs and expenses (including reasonable attorney's fees) arising or resulting, directly or indirectly, from any negligent action or failure to act on the part of Cooperator or breach by Cooperator of any of its obligations, representations and warranties under this Agreement. The GSA will indemnify, defend and hold harmless Cooperator from any and all claims, demands, causes of action, damages, judgments, losses, liabilities, costs and expenses (including reasonable attorney's fees) arising or resulting, directly or indirectly, from any negligent action arising from the entry of the GSA's representatives on the Property or breach by the GSA of any of its obligations under this Agreement (provided that the foregoing shall not apply to any such claims or actions to the extent arising from the absence of any Consent). Notwithstanding the foregoing, in no event will any party be liable for consequential, incidental or special damages.

This Section 8 will survive the termination or expiration of this Agreement or any part thereof.

9. Notice

Except as provided for in this Agreement, or for such day-to-day communications or instructions as may be called for or reasonably anticipated in the description of the work to be done under this Agreement (none of which may, however, alter the terms of this Agreement), any notice, demand, request, consent, or approval of any kind that any party to this Agreement desires or is required to give to or make on another party under or in connection with this Agreement (a "Notice") will be in writing and will be served upon the party being addressed, at the most recent address which the addressed party has provided for such purposes under this Agreement. Notice pursuant to section 3 of this Agreement is exempted from these Notice requirements.

Each Notice will be given by at least one of the following means: (1) delivery in person, (2) certified U.S. mail, return receipt requested, postage prepaid, or (3) Federal Express or other reputable "overnight" delivery service, provided that next-business-day delivery is requested by the sender. Notices delivered in person will be deemed effective immediately upon delivery (or refusal of delivery or receipt). Notices sent by certified mail will be deemed given on the earlier to occur of: (1) the date of first attempted delivery; or (2) the third day after being deposited in the mail. Notices sent by Federal Express or other reputable "overnight" delivery service will be deemed given on the next-business-day after being deposited with the delivery service. Either party may, from time to time, by written notice to the other, designate a different address, which will be substituted for the most current address previously provided for such purposes under this Agreement.

This Section 9 will survive the termination or expiration of this Agreement or any part thereof.

10. Anti-Terrorist Certification

Cooperator agrees that it will use any funds received under this Agreement in compliance with all applicable antiterrorist financing and asset control laws, regulations, rules and executive orders, including but not limited to the USA Patriot Act of 2001 and Executive Order 13224.

11. Conflicts of Interest Disclosure

Cooperator certifies that the information it has provided on the "Conflict of Interest Disclosure Form" which is being provided to Cooperator by the GSA with respect to this Agreement (the "Disclosure Form") is true and correct to the best of Cooperator's knowledge. In the event that any material misrepresentation by Cooperator in such Disclosure Form is discovered during the term of this Agreement, the GSA may elect to declare this Agreement null and void and immediately terminate it.

12. State Regulations

This Agreement is further subject to the additional terms and conditions set forth in **Exhibit B** ("State Government Laws and Regulations").

13. Use of Data

The GSA will own all data collected and processed during the Well Monitoring Program and all data collected shall be made available to the State and shall be in the public domain. The data collected will be consolidated and made available publicly. Data will include identifying information including the location of each well and the name of the Cooperator associated with that well.

14. Miscellaneous

This Agreement will become binding when signed by the Cooperator and the GSA. This Agreement supersedes all prior or contemporaneous communications and negotiations, both oral and written, concerning the subject matter of this Agreement and constitutes the entire agreement between the GSA and Cooperator with respect to such matters. No amendment to this Agreement will be effective unless it is in writing and is signed by all of the parties hereto. This Agreement will be interpreted and construed under, and will be and governed by, the internal laws of the State of California, without regard to any choice of law rules. Time is of the essence in this Agreement. The terms and conditions of this Agreement are binding upon Cooperator and its successors and assigns. Each party will bear and pay its own expenses, including, in the case of the Cooperator, any costs of preparing the Property for or otherwise participating in the Well Monitoring Program.

Any and all exhibits, schedules, and addenda attached to and referred to in this Agreement are hereby incorporated into this Agreement as fully as if set out in their entirety herein, but in the event of any conflict between the terms of this main body of the Agreement and the terms of any exhibits, addenda, or other attachments to this Agreement, the terms of this main body of the Agreement will control. The provisions of this Agreement will survive the expiration or termination of this Agreement to the extent of any rights accrued or obligations incurred during such term, and Sections 7, 8, 9 and 14 and State's right to audit under the Audit Clause in **Exhibit B** shall survive any expiration or termination of this Agreement. If any provision of this Agreement is held to be invalid or unenforceable, the other provisions will not be affected thereby. This Agreement may be executed in several counterparts, and all counterparts so executed will constitute one Agreement which will be binding on all of the parties, notwithstanding that all of the parties are not signatory to the same

counterpart. Electronic signatures, digital signatures, fax signatures, and scanned signatures are acceptable for this Agreement in compliance with the Uniform Electronic Transactions Act (UETA).

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed and delivered as of the date first above written.

COOPERATOR	**GSA**
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

Attachments:

Exhibit A – Manual Data Collection Form
Exhibit B – State Government Laws and Regulations

Exhibit A
Manual Data Reporting Form

If there is an equipment failure during the period of this agreement, the Cooperator must manually collect well flow data and provide it to the GSA. Monthly flow totals must be recorded from the flow meter totalizer. If there is a failure of the flow meter totalizer, report the total number of hours of pumping for that month.

Month/Year	Total Volume (or hours)	Date and Time Recorded
April 2022		
May 2022		
June 2022		
July 2022		
August 2022		
September 2022		
October 2022		
November 2022		
December 2022		
January 2023		
February 2023		
March 2023		
April 2023		
May 2023		
June 2023		
July 2023		
August 2023		
September 2023		
October 2023		
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January 2024		
February 2024		
March 2024		
April 2024		
May 2024		
June 2024		
July 2024		
August 2024		
September 2024		
October 2024		
November 2024		
December 2024		

Exhibit B
State Government Laws and Regulations

Accounting
During the performance of this Agreement, Cooperator and its subcontractors shall maintain books, records, and other documents pertinent to their work under this Agreement in accordance with generally accepted accounting principles and practices. Records are subject to inspection by the State of California at any time.

Acknowledgment of Credit and Signage
Cooperator shall appropriately acknowledge the State for its support when promoting the Project.

Audit Clause
Cooperator agrees that all parties to the Agreement, the State of California, the State Department of General Services, the Bureau of State Audits, or their designated representative(s), shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Agreement. Cooperator agrees to maintain such records for possible audit for a minimum of three (3) years from the final payment made under the Grant Agreement, unless a longer period of records retention is stipulated elsewhere in this Agreement. Cooperator agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, Cooperator agrees to include a similar right of the State and all parties to the Agreement to audit records and interview of staff in any further subcontract made under this Agreement. (Government Code Section 8546.7, Public Contract Code Section 10115 et seq., California Code of Regulations Title 2, Section 1896.60 et seq.)

Drug-Free Workplace Requirements
By signing this Agreement, Cooperator hereby certifies under penalty of perjury under the laws of the State of California that Cooperator will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.
2. Establish a Drug-Free Awareness Program to inform employees about:
    a. The dangers of drug abuse in the workplace;
    b. The person's or organization's policy of maintaining a drug-free workplace;
    c. Any available counseling, rehabilitation and employee assistance programs; and
    d. Penalties that may be imposed upon employees for drug abuse violations.
3. Provide that every employee who works on this Agreement:
    a. Will receive a copy of the company's drug-free policy statement; and,
    b. Will agree to abide by the terms of the company's statement as a condition of employment on this Agreement.

Failure to comply with these requirements may result in suspension of payments under this Agreement or termination of this Agreement, or both, and Cooperator may be ineligible for award of any future State agreements if the State determines that any of the following has occurred: (1) Cooperator has made false certification, or (2) Cooperator has violated the certification by failing to carry out the requirements as noted above.

Glenn Groundwater Authority Groundwater Sustainability Agency Agreement (Updated for Phase 2)

AGREEMENT FOR WELL MONITORING PROGRAM

This agreement ("Agreement") is made as of _____, by and between

_____ ("Cooperator"), having an address of

_____ ,
and the Glenn Groundwater Authority Groundwater Sustainability Agency ("GSA"), having an address of 225 North Tehama Street, Willows CA 95988.

BACKGROUND

The GSA is implementing an incentive-based pilot program to work with growers and landowners to continuously monitor groundwater use and water levels at participating wells ("Well Monitoring Program"). This voluntary, non-regulatory program is intended to support the GSA in gathering information regarding groundwater use in the Colusa Subbasin while providing participants with near-real time access to information on well production and groundwater levels at their wells to support irrigation management. This program is being funded through a Proposition 68 Sustainable Groundwater Management grant (the "Grant Agreement") from the California Department of Water Resources (the "State"). Under the terms of this Agreement, the GSA will cover the primary costs of monitoring well production and groundwater levels, including the cost of a new or upgraded flow meter (as needed) and level sensor, a datalogger, a solar panel, and a cellular modem. The GSA will also cover 50% of the cost of a 3-year subscription to web and mobile access for the data gathered. The Cooperator will be responsible for equipment installation and maintenance, as well as 50% of the cost of a 3-year subscription for web and mobile data access (full payment at the beginning of the program). Program participation may be extended beyond three years, as mutually agreed by the Cooperator and the GSA.

TERMS AND CONDITIONS

Cooperator and the GSA agree to the following terms and conditions:

1. Term of Agreement

This Agreement will commence on the date last signed below (the "Commencement Date") and will expire on December 31, 2024 (the "Expiration Date"). Upon such expiration, the parties will have no further rights or obligations under this Agreement, except as specifically provided in this Agreement.

2. Well Monitoring Program Provision Requirements

    a. Site Preparation. The Cooperator will provide an access tube for the level sensor in the well casing, as needed, as well as an appropriate site for the flow meter and the solar panel.

    b. Equipment Specifications. The GSA agrees to provide the Cooperator with a McCrometer or SeaMetrics flow meter, or other flow meter as approved by the GSA. The GSA agrees to provide the Cooperator with a datalogger, solar panel, and telemetry sourced by Ranch Systems.

c. Equipment Installation. The Cooperator agrees to install the provided flow meter, level sensor, and telemetry equipment (including, but not limited to the data logger, solar panel, and cellular modem) and begin data collection within 30 days of receiving the equipment. If upgrades are being made to existing flow meters or sensors, the Cooperator agrees to complete upgrades and commence data collection no later than 30 days after receiving the telemetry equipment. The Cooperator agrees to install all equipment in compliance with manufacturer specification.

d. Cooperator Responsibilities – Equipment and Data. The Cooperator agrees to maintain the equipment in good, working order. In the event of a device failure, the Cooperator agrees to notify the GSA and manually report their pumping data. Pumping data must be reported as monthly volume from the flow meter totalizer. If the flow meter totalizer fails, pumping data must be reported as monthly hours of pumping. Manual data must be reported using the form in Exhibit A and submitted via email, mail, or fax to the GSA. The Cooperator is responsible for maintaining the data record until the GSA has confirmed that they have received the data automatically following any corrective actions required.

e. Responsibilities – Telemetry. The GSA and the Cooperator agree to each pay 50% of the cost for a 3-year subscription for web and mobile access to Ranch Systems . Full payment is due at the beginning of the program.

3. Access to Property, Duty of Care

Cooperator hereby irrevocably grants the GSA and its employees, funders, guests, invitees, subcontractors, agents and assigns permission to enter the Property to inspect wells, verify installation, and collect manual measurements as needed on the Property until the Expiration Date. The GSA or its representative will provide Cooperator with at least 24 hours' notice prior to entering the Property unless Cooperator agrees to a shorter notice period. Notice under this section may be provided verbally or in writing, including by text, email or fax.

During the term of this Agreement, Cooperator and the GSA agree that: (a) the GSA and its employees, funders, guests, invitees, subcontractors, agents and assigns will coordinate their activities with Cooperator in order not to unreasonably disturb ongoing maintenance operations and other farm activities on the Property or on Cooperator's adjacent property, if applicable; (b) Cooperator will comply with all federal, state, and local laws and regulations and any contractual obligations relating to the use of the Property; and (c) Cooperator will take, use, provide and make proper, necessary and sufficient precautions, safeguards and protections against the occurrence of any accidents, injuries or damages to any person or the Property.

4. Payment Terms; Termination

If the terms of this Agreement have been met and there has been no material breach of this Agreement by Cooperator, the GSA fund the cost of purchasing or upgrading the flow meter (up to $2,500) and level sensor. The GSA will also fund the cost of the telemetry installation (including datalogger, solar panel, and cellular modem). The GSA and Cooperator will each pay 50% of the cost of Ranch Systems web and mobile data access for three years. No payments will be made by the GSA to the Cooperator. The GSA will not cover costs for labor for installation, repair, or data collection. If the Cooperator breaches in any material respect any of the terms of this Agreement, then the GSA may

terminate this Agreement and, upon such termination, neither party will have any further obligation or liability to one another under this Agreement, except as provided in Sections 7, 8, 9 and 14.

5. Force Majeure

The failure of either party to perform any obligation otherwise due solely as a result of (a) governmental action, laws, orders, regulations, directions or requests, or (b) as a result of events, such as war, acts of public enemies, strikes or other labor disturbances, fires, floods, acts of God or any causes of like kind beyond the reasonable control of such party (collectively referred to as “Force Majeure"), is excused for so long as such Force Majeure exists or until the parties agree to terminate this Agreement.

6. Property Management and Notification of Changes in Operation, Lease or Ownership

During the term of this Agreement, Cooperator and Cooperator’s representatives and assigns (including all subcontractors and lessees) will manage the Property in accordance with this Agreement and so as not to disturb the nature of this project.

Cooperator intends to maintain title or a valid leasehold interest in the Property for the duration of the Agreement and will promptly notify the GSA of any planned or pending changes in operation, lease or ownership of the Property.

No exercise of the rights granted herein will give rise to any claim of title to the Property on the part of the GSA or parties claiming through or under them. This Agreement and the rights granted herein may not be assigned, in whole or in part, by Cooperator without the written consent of the GSA.

7. Cooperator’s Representations and Warranties

Cooperator represents and warrants that: (a) it has the power and authority to enter into this Agreement and to perform the actions contemplated hereunder, (b) it has obtained all consents necessary for its participation in the Well Monitoring Program and its performance of the terms of this Agreement (including without limitation the consents of any landowners and any persons with other rights with respect to the Property) (such consents, the “Consents”), (c) it has provided the GSA with a written description of all Consents, and (d) no other agreements or obligations concerning the Property interfere with Cooperator’s right or ability to perform its obligations hereunder or will be violated by Cooperator’s performance of such obligations. Cooperator further represents and warrants that Cooperator has conducted its own review of its participation in the Well Monitoring Program and its taking of or omission of actions required by or related to this Agreement, that, except as expressly provided in this Agreement, neither the GSA nor any person affiliated with or otherwise on behalf of the GSA is making or has made any representation or warranty, written or oral, with respect to the Well Monitoring Program or otherwise, and that Cooperator has not relied and will not rely on any such representation or warranty or any omissions by any such persons whether made on, before or after the date hereof, except as expressly set forth in this Agreement.

Without limiting the foregoing, if the Property is owned by any person (the “Landowner”) other than Cooperator, then Cooperator represents and warrants that Cooperator has the right to execute and perform this Agreement with respect to the Property, without the consent of the Landowner (except for any consent as Cooperator may already have obtained and which is irrevocable with respect to Cooperator’s participation in the Well Monitoring Program), and that the Landowner will not have any rights against the GSA in respect of Cooperator’s performance under or in any way related to this

Agreement and Cooperator's participation in the Well Monitoring Program. At the request of the GSA, Cooperator will arrange for a meeting of the GSA with the Landowner.

This Section 7 will survive the termination or expiration of this Agreement or any part thereof.

8. Indemnification

Cooperator assumes the risk of any damage caused by its participation in the Well Monitoring Program. Cooperator will indemnify, defend and hold harmless the GSA, its affiliates and funders and their officers, directors, members, employees and agents from and against any and all claims, demands, causes of action, damages, judgments, losses, liabilities, costs and expenses (including reasonable attorney's fees) arising or resulting, directly or indirectly, from any negligent action or failure to act on the part of Cooperator or breach by Cooperator of any of its obligations, representations and warranties under this Agreement. The GSA will indemnify, defend and hold harmless Cooperator from any and all claims, demands, causes of action, damages, judgments, losses, liabilities, costs and expenses (including reasonable attorney's fees) arising or resulting, directly or indirectly, from any negligent action arising from the entry of the GSA's representatives on the Property or breach by the GSA of any of its obligations under this Agreement (provided that the foregoing shall not apply to any such claims or actions to the extent arising from the absence of any Consent). Notwithstanding the foregoing, in no event will any party be liable for consequential, incidental or special damages.

This Section 8 will survive the termination or expiration of this Agreement or any part thereof.

9. Notice

Except as provided for in this Agreement, or for such day-to-day communications or instructions as may be called for or reasonably anticipated in the description of the work to be done under this Agreement (none of which may, however, alter the terms of this Agreement), any notice, demand, request, consent, or approval of any kind that any party to this Agreement desires or is required to give to or make on another party under or in connection with this Agreement (a "Notice") will be in writing and will be served upon the party being addressed, at the most recent address which the addressed party has provided for such purposes under this Agreement. Notice pursuant to section 3 of this Agreement is exempted from these Notice requirements.

Each Notice will be given by at least one of the following means: (1) delivery in person, (2) certified U.S. mail, return receipt requested, postage prepaid, or (3) Federal Express or other reputable "overnight" delivery service, provided that next-business-day delivery is requested by the sender. Notices delivered in person will be deemed effective immediately upon delivery (or refusal of delivery or receipt). Notices sent by certified mail will be deemed given on the earlier to occur of: (1) the date of first attempted delivery; or (2) the third day after being deposited in the mail. Notices sent by Federal Express or other reputable "overnight" delivery service will be deemed given on the next-business-day after being deposited with the delivery service. Either party may, from time to time, by written notice to the other, designate a different address, which will be substituted for the most current address previously provided for such purposes under this Agreement.

This Section 9 will survive the termination or expiration of this Agreement or any part thereof.

10. Anti-Terrorist Certification

Cooperator agrees that it will use any funds received under this Agreement in compliance with all applicable antiterrorist financing and asset control laws, regulations, rules and executive orders, including but not limited to the USA Patriot Act of 2001 and Executive Order 13224.

11. Conflicts of Interest Disclosure

Cooperator certifies that the information it has provided on the "Conflict of Interest Disclosure Form" which is being provided to Cooperator by the GSA with respect to this Agreement (the "Disclosure Form") is true and correct to the best of Cooperator's knowledge. In the event that any material misrepresentation by Cooperator in such Disclosure Form is discovered during the term of this Agreement, the GSA may elect to declare this Agreement null and void and immediately terminate it.

12. State Regulations

This Agreement is further subject to the additional terms and conditions set forth in **Exhibit B** ("State Government Laws and Regulations").

13. Use of Data

The GSA will own all data collected and processed during the Well Monitoring Program and all data collected shall be made available to the State and shall be in the public domain. The data collected will be consolidated and made available publicly. Data will include identifying information including the location of each well and the name of the Cooperator associated with that well.

14. Miscellaneous

This Agreement will become binding when signed by the Cooperator and the GSA. This Agreement supersedes all prior or contemporaneous communications and negotiations, both oral and written, concerning the subject matter of this Agreement and constitutes the entire agreement between the GSA and Cooperator with respect to such matters. No amendment to this Agreement will be effective unless it is in writing and is signed by all of the parties hereto. This Agreement will be interpreted and construed under, and will be and governed by, the internal laws of the State of California, without regard to any choice of law rules. Time is of the essence in this Agreement. The terms and conditions of this Agreement are binding upon Cooperator and its successors and assigns. Each party will bear and pay its own expenses, including, in the case of the Cooperator, any costs of preparing the Property for or otherwise participating in the Well Monitoring Program.

Any and all exhibits, schedules, and addenda attached to and referred to in this Agreement are hereby incorporated into this Agreement as fully as if set out in their entirety herein, but in the event of any conflict between the terms of this main body of the Agreement and the terms of any exhibits, addenda, or other attachments to this Agreement, the terms of this main body of the Agreement will control. The provisions of this Agreement will survive the expiration or termination of this Agreement to the extent of any rights accrued or obligations incurred during such term, and Sections 7, 8, 9 and 14 and State's right to audit under the Audit Clause in **Exhibit B** shall survive any expiration or termination of this Agreement. If any provision of this Agreement is held to be invalid or unenforceable, the other provisions will not be affected thereby. This Agreement may be executed in several counterparts, and all counterparts so executed will constitute one Agreement which will be binding on all of the parties, notwithstanding that all of the parties are not signatory to the same

counterpart. Electronic signatures, digital signatures, fax signatures, and scanned signatures are acceptable for this Agreement in compliance with the Uniform Electronic Transactions Act (UETA).

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed and delivered as of the date first above written.

COOPERATOR	**GSA**
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

Attachments:

Exhibit A – Manual Data Collection Form
Exhibit B – State Government Laws and Regulations

Exhibit A
Manual Data Reporting Form

If there is an equipment failure during the period of this agreement, the Cooperator must manually collect well flow data and provide it to the GSA. Monthly flow totals must be recorded from the flow meter totalizer. If there is a failure of the flow meter totalizer, report the total number of hours of pumping for that month.

Month/Year	Total Volume (or hours)	Date and Time Recorded
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Exhibit B
State Government Laws and Regulations

Accounting
During the performance of this Agreement, Cooperator and its subcontractors shall maintain books, records, and other documents pertinent to their work under this Agreement in accordance with generally accepted accounting principles and practices. Records are subject to inspection by the State of California at any time.

Acknowledgment of Credit and Signage
Cooperator shall appropriately acknowledge the State for its support when promoting the Project.

Audit Clause
Cooperator agrees that all parties to the Agreement, the State of California, the State Department of General Services, the Bureau of State Audits, or their designated representative(s), shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Agreement. Cooperator agrees to maintain such records for possible audit for a minimum of three (3) years from the final payment made under the Grant Agreement, unless a longer period of records retention is stipulated elsewhere in this Agreement. Cooperator agrees to allow the auditor(s) access to such records during normal business hours and to allow interviews of any employees who might reasonably have information related to such records. Further, Cooperator agrees to include a similar right of the State and all parties to the Agreement to audit records and interview of staff in any further subcontract made under this Agreement. (Government Code Section 8546.7, Public Contract Code Section 10115 et seq., California Code of Regulations Title 2, Section 1896.60 et seq.)

Drug-Free Workplace Requirements
By signing this Agreement, Cooperator hereby certifies under penalty of perjury under the laws of the State of California that Cooperator will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.
2. Establish a Drug-Free Awareness Program to inform employees about:
    a. The dangers of drug abuse in the workplace;
    b. The person's or organization's policy of maintaining a drug-free workplace;
    c. Any available counseling, rehabilitation and employee assistance programs; and
    d. Penalties that may be imposed upon employees for drug abuse violations.
3. Provide that every employee who works on this Agreement:
    a. Will receive a copy of the company's drug-free policy statement; and,
    b. Will agree to abide by the terms of the company's statement as a condition of employment on this Agreement.

Failure to comply with these requirements may result in suspension of payments under this Agreement or termination of this Agreement, or both, and Cooperator may be ineligible for award of any future State agreements if the State determines that any of the following has occurred: (1) Cooperator has made false certification, or (2) Cooperator has violated the certification by failing to carry out the requirements as noted above.

Staff Report

To: CGA-GGA Joint TAC

Agenda Item: 9. Discussion of 2022/2023 Grant Application

Date: July 8, 2022

Background

DWR is administering the Sustainable Groundwater Management (SGM) Grant Program Sustainable Groundwater Management Act (SGMA) Implementation funding solicitation using funds authorized by the California Budget Act of 2021 (Stats. 2021, ch. 240, § 80) and the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68). The program is summarized below:

- Anticipated Opening Date: September/October 2022
- Period of Performance: 3 years
- Expected Award Announcement: July 2023
- Agreements executed: September/November 2023
- Total Est. Funding Available: $202,500,000, from General Fund and Proposition 68
- Estimated amount per award: $1,000,000 to 20,000,000
- Description: DWR will solicit proposals to award funding through a competitive application basis for tasks and activities that help the basins reach sustainability through investments in groundwater recharge and/or projects that prevent or clean up contamination of a groundwater that serves as a source of drinking water. Tasks and activities can also include updating/revising/modifying a GSP(s)
- Work Allowed: Planning & Implementation Projects.
- **Only one application will be accepted per basin**.
- No match funding required. Funding is provided in arrears as reimbursement, quarterly invoices.

As this opportunity draws nearer, it is critical that the CGA and GGA coordinate on a single application for the Colusa Subbasin. The Colusa Subbasin GSP Projects and Management Actions (PMAs) (planned, ongoing, and potential) should be reviewed, along with any new potential PMAs. The Colusa Subbasin GSP Table 6-2 Summary of All Projects and Management Actions is included as an attachment. The GSP implementation studies and updates should also be evaluated. The Colusa Subbasin GSP Table 7-1 Summary of GSP Implementation Studies is included as an attachment.

The CGA and GGA have directed their respective TAC to coordinate through the Joint TAC to review and recommend a prioritized list of GSP Implementation Studies and/or PMAs to include in the grant application.

More information about the grant program can be found on DWR's website at: https://water.ca.gov/work-with-us/grants-and-loans/sustainable-groundwater

Recommendation

Receive information from consultant team and staff; hold discussion to begin prioritizing studies and PMAs to recommend for inclusion in the SGM grant application.

Attachments

- Colusa Subbasin Table 6-2 Summary of all Projects and Management Actions
- Colusa Subbasin Table 7-1 Summary of GSP Implementation Studies

The rest of this chapter is structured as follows. Section 6.2 provides a summary of all (ongoing, planned, and potential) PMAs. The three subsequent sections – Sections 6.3 through 6.5 – describe the PMAs in each of the three categories. Within each category, PMAs are further classified by type (project or management action), which are described in corresponding subsections. Appendix 6A provides additional analysis of water available for recharge and other projects, as well as an assessment of incentives to encourage utilization of surface water supplies. Appendix 6B describes potential demand management action costs and Subbasin agricultural economic conditions. Appendix 6C provides a matrix summary of all planned, ongoing, and potential PMAs. Lastly, Appendix 6D describes modeling of selected PMAs to estimate the effects of those PMAs on groundwater conditions in the Subbasin.

6.2 PROJECT AND MANAGEMENT ACTIONS SUMMARY

6.2.1 Overview of All Proposed Projects and Management Actions

Table 6-2 summarizes all PMAs identified in the Subbasin. Summary information includes the PMA name, type, proponent, and a brief description. PMA types include:

- **Direct groundwater recharge:** PMAs that recharge groundwater using available surface water, flood water, stormflows, or other surface water supplies.
- **In-lieu groundwater recharge:** PMAs that offset groundwater pumping by supplying or otherwise incentivizing use of surface water or other surface water supplies "in lieu" of groundwater.
- **Management action:** Non-structural programs or policies designed to support sustainable groundwater management.
- **Reduce groundwater demand:** PMAs that reduce or remove sources of groundwater demand and extraction, such as invasive and non-native plant species along riparian corridors.

PMAs are grouped into subsections in the table according to their status (planned, ongoing, or potential). As described under Section 6.1 above, ongoing projects are currently being implemented in the Subbasin. Planned PMAs are currently being developed to achieve sustainable management conditions in the Subbasin. Potential PMAs will be implemented in the future, if or as required by changing conditions in the Subbasin.

All PMAs are described according to the requirements of 23 CCR §354.44(b). Planned projects are described in detail. Ongoing and potential PMAs are described concisely, reflecting the current operational status and "as-needed" basis of these projects. It is anticipated that additional information will be prepared in annual reports and five-year GSP updates, as needed.

Not all PMAs are the responsibility of the GSAs: some PMAs will be completed through a partnership with other agencies and proponents, while other PMAs will be completed by the agency or other proponents with support from the GSAs. The GSAs and/or other project proponents will notify the public and other agencies of the planned or ongoing implementation of PMAs through the communication channels identified in Sections 6.3 through 6.5 (23 CCR §354.44(b)(1)(B)). Noticing will occur as potential projects are being considered for implementation, and as ongoing and planned projects are implemented. Noticing will inform the public and other agencies that the GSA and/or other project proponents are considering or will be implementing the PMA, and will provide a description of the actions that will be taken.

The following subsections describe the planned, ongoing, and potential PMAs in accordance with the requirements of 23 CCR §354.44(b). The information presented in this chapter is based on the best available data and science. The estimated groundwater recharge benefit and capital, operating, and maintenance costs of developing and operating each project are shown. To the extent possible, project costs are adjusted and reported on a consistent basis. All costs are indexed using an appropriate index[4] and reported in current (2021) dollars. GSAs, districts, and other partners in the Subbasin will further develop projects during the GSP implementation period and refine estimated costs in GSP annual reports and five-year updates. Additional information about all PMAs is provided in a matrix format in Appendix 6C.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Planned			
Projects			
Colusa County Water District (CCWD) In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	CCWD	CCWD will utilize 30 taf of additional surface water for irrigation in all years but Shasta Critical years for in-lieu recharge. The additional surface water will be made available through full use of the district's existing Central Valley Project (CVP) contract and annual and multi-year water purchase and transfer agreements. Additional surface water deliveries are estimated to be 27 taf/yr, enabling reduction of groundwater pumping by a like amount.
Colusa Drain MWC (CDMWC) In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	CDMWC	CDMWC diverters use both ground and surface water because Colusa Drain supplies are insufficient to satisfy all irrigation requirements. This project would provide additional surface supplies averaging approximately 28 taf/yr in the Drain allowing CDMWC diverters to increase their diversions of surface water to provide in-lieu groundwater recharge of a like amount.
Subbasin Multi-Benefit Groundwater Recharge	Direct Groundwater Recharge	CGA, GGA and TNC	The Nature Conservancy (TNC) is partnering with entities for an on-farm, multi-benefit groundwater recharge incentive program. The pilot program was initiated in Colusa County in 2018 and concluded in the spring of 2021, with plans to expand and continue into the future. DWR is a partner in the Subbasin Multi-Benefit Groundwater Recharge project as it moves into the expanded program.

[4] Either the Implicit Price Deflator or the Engineering News Report Construction Cost Index.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Orland-Artois Water District (OAWD) Land Annexation and Groundwater Recharge	Direct and In-lieu Groundwater Recharge	OAWD	OAWD is planning to annex approximately 12,000 acres of groundwater-dependent agricultural lands. Additional direct recharge may be considered on suitable annexed lands. The project is an area where groundwater levels have been in decline in recent years. It is estimated that a long-term average of approximately 23 taf/yr of surface water would be available, reducing groundwater pumping by approximately 23 taf/yr.
Sycamore Slough Groundwater Recharge Pilot Project	Direct Groundwater Recharge	Landowner	Proctor and Gamble (P&G) and Davis Ranches have entered into an agreement to implement a 10-year groundwater recharge pilot project. A 66-acre field on Davis Ranches will receive surface water for groundwater recharge and provide habitat for migrating shorebirds. Water would be diverted from the Sacramento River during fall/winter months using existing riparian rights or would be available from settlement contract supplies (should the project begin before November 1). An expansion of the project is planned for recharge and revegetation in the neighboring Sycamore and Dry Sloughs.
Ongoing			
Projects			
Reclamation District 108 (RD108) and Colusa County Water District (CCWD) Agreement for Five-Year In-Lieu Groundwater Recharge Project	In-lieu Groundwater Recharge	RD108 and CCWD	CCWD (and Dunnigan Water District [DWD]) purchases surface water from RD108 for distribution within its service area. The agreement expires in 2022. This project supplies additional surface water to CCWD (and DWD) that provides in-lieu recharge.
Glenn-Colusa Irrigation District (GCID) Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Direct and In-lieu Groundwater Recharge	GCID	GCID holds a water right for winter water. This project will increase the groundwater recharge and habitat enhancement benefits of winter water use by increasing use for rice straw decomposition, irrigation, and frost control provided that certain constraints can be alleviated.
Sycamore Marsh Farm Direct Recharge Project	Direct Groundwater Recharge	Landowner	Sycamore Marsh Farm is developing a groundwater recharge plan to store groundwater. The plan provides for 205 acres of year-round recharge basins and 163 additional acres of winter recharge areas.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID	GCID has developed arrangements to supply district surface water to neighboring non-district agricultural lands that primarily use groundwater. These temporary arrangements expired in 2020. There is interest in continuing and expanding this in-basin surface water use for in-lieu groundwater recharge. Supplies would potentially be available only in Shasta Non-Critical years.
Orland Unit Water Users Association (OUWUA) Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	In-lieu Groundwater Recharge	OUWUA	Modernization of OUWUA southside system for more reliable and flexible farm deliveries that will provide incentive for growers to use more surface water and less groundwater.
Management Actions			
Urban Water Conservation in Willows	Management Action	California Water Service – Willows District	This project includes urban water conservation measures through water waste prevention ordinances, metering, conservation pricing, public education, and outreach programs to assess and manage distribution system real loss, water conservation program coordination and staffing support, and other demand management measures.
Potential			
Projects			
Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID	GCID will investigate, develop, and implement measures to incentivize additional use of surface water supplied by GCID, which will provide in-lieu recharge through reduced groundwater pumping.
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	Direct and In-lieu Groundwater Recharge	CGA and GGA	A portion of western ephemeral stream flows could be diverted for in-lieu or direct groundwater recharge.
Sites Reservoir	Direct and In-lieu Groundwater Recharge	Sites Project Authority	The Sites Project is a new off-stream storage facility that is currently in development. Depending on project operation and yield, there is potential for groundwater benefits to accrue to the Subbasin from Sites Reservoir.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Delevan Pipeline Colusa Basin Drainage Canal System (Colusa Drain) Intertie	Direct and In-lieu Groundwater Recharge	Interested Stakeholder	Intertie between proposed Delevan Pipeline component of the Sites Reservoir Project and the Colusa Drain, providing a connection to downstream water users, and providing protection for the ecosystems, and earthquake resilience.
Orland Unit Water Users Association (OUWUA) Flood Water Conveyance	Direct Groundwater Recharge	OUWUA	Divert Stony Creek water at OUWUA's south diversion and convey it to various locations for direct recharge within the OUWUA service area.
Orland-Artois Water District (OAWD) Direct Groundwater Recharge	Direct Groundwater Recharge	OAWD	OAWD would directly recharge groundwater. A pilot project was conducted in 2017.
Sycamore Slough Colusa Drain Multi-Benefit Recharge Project	Direct Groundwater Recharge	Landowner	Restoration of portions of Sycamore Slough would support diversion of winter flows from the Colusa Drain for recharge and restoration.
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	Direct Groundwater Recharge	RD108	Operate Tehama-Colusa Canal (TCC) existing gates for discharge into ephemeral streams at a rate where they do not flow out of the Subbasin but recharge the groundwater system.
Enhanced Infiltration of Precipitation on Agricultural Lands	Direct Groundwater Recharge	CGA and GGA	Develop and adoption of on-farm cultural practices to reduce precipitation runoff and increase infiltration, which would result in increased storage of precipitation in the crop root zone, thereby reducing irrigation water requirements and achieving some direct groundwater recharge.
Subbasin Flood-MAR	Direct Groundwater Recharge	CGA and GGA	The CGA and GGA would investigate, develop, and implement a program to divert flood waters within the Subbasin, when available, for spreading across agricultural lands for direct groundwater recharge.
Reclamation District 108 “Boards In” Program	Direct Groundwater Recharge	RD108	RD108 would institute a voluntary or financially incentivized program in which landowners leave spill boards in place during the winter to capture rainfall and hold it on the fields for recharge.
Colusa County Public Water System Water Treatment Plant	In-lieu Groundwater Recharge	Interested Stakeholder	Construct a water treatment plant on the Sacramento River between Colusa and Grimes to provide treated surface water to public water supply systems in Colusa and possibly Sutter and Yolo Counties.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Glenn-Colusa Irrigation District Water Transfers to Tehama-Colusa Canal Authority (TCCA) CVP Contractors	In-lieu Groundwater Recharge	GCID	Evaluate potential for transferring water to CVP contractors served by the TCC for in-lieu groundwater recharge.
Subbasin In-lieu Recharge & Banking Program	In-lieu Groundwater Recharge	South Valley Water Resources Authority	Incentivize taking available contract surface water in-lieu of pumping groundwater, providing dedicated contribution to local groundwater sustainability, with a portion available to San Joaquin Valley partners.
Sycamore Marsh Farm In-lieu Recharge Project	In-lieu Groundwater Recharge	Landowner	Sycamore Marsh Farm is developing an in-lieu groundwater recharge plan, and could partner with additional lands in the CDMWC, allowing for diversion of surface water from CDMWC.
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	TCCA Contractors	Construct off-stream surface reservoirs along the western edge of the Subbasin and up-slope from the TCC to divert surplus Sacramento River flows (e.g., Section 215 water) into these storage reservoirs. Release stored water on demand to serve lands otherwise served by groundwater.
Management Actions			
Domestic Well Mitigation Program	Management Action	CGA and GGA	To mitigate the effects of domestic well stranding due to groundwater level decline, the CGA and GGA will investigate implementing domestic well mitigation programs in their respective portions of the Subbasin.
Drought Contingency Planning for Urban Areas	Management Action	CGA, GGA, and cities (GSA member agencies)	The CGA and GGA will coordinate with M&I water suppliers dependent on groundwater to encourage drought planning consistent with the GSP.
Long-Term Demand Management Action	Management Action	CGA and GGA	Demand management broadly refers to any water management activity that reduces the consumptive use of irrigation water. A demand management action is one that incentivizes, enables, or possibly requires water users to reduce their consumptive use.
Strategic Short-Term Demand Management	Management Action	CGA and GGA	Develop a voluntary, flexible, short-run financial incentive program to alleviate impacts of drought in target areas through idling lands in drought-affected areas or in participating surface water-using portions of the Subbasin and conveying the saved surface water to the drought-affected areas.

Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Well Abandonment Outreach and Funding Program	Management Action	CGA and GGA	Create a program providing outreach and education to landowners regarding the proper procedures for well decommissioning and abandonment, as well as funding sources. This effort would be accomplished by working with well permitting agencies.
Preservation of Lands Favorable for Recharge	Management Action	CGA and GGA	Working cooperatively with the counties, investigate, design, and implement a program providing incentives to landowners with lands favorable to groundwater recharge to preserve them as agricultural or undeveloped lands on which groundwater recharge.
Review of County Well Permitting Ordinances	Management Action	CGA and GGA	Review and revise the county well permitting processes in the Subbasin to ensure that future well permitting aligns with the Subbasin sustainability goal and that future changes to well permitting are reviewed by the GSAs. The GSAs would work with the counties to review and suggest revisions to ordinances (these are outside of the jurisdiction of the GSAs).
Reduce Non-beneficial Evapotranspiration/ Invasive Species Eradication	Reduce Groundwater Demand	CGA and GGA	Removal of invasive, non-native plant species from riparian corridors and other areas to reduce evapotranspiration from shallow groundwater and support native ecosystem restoration.
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	Management Action, Closing Data Gaps	CGA and GGA	Evaluate and develop a dedicated network of shallow monitoring wells specifically planned and sited for monitoring conditions in areas of the Subbasin where GDEs are most likely to be found. This action is also expected to incorporate biological monitoring to inform the location of new shallow monitoring wells and monitor whether GDEs are being impacted by changing groundwater conditions.

6.2.2 Benefits of Projects and Management Actions to Sustainability Indicators and Communities in the Subbasin

Volumetric benefits of all planned PMAs are identified in Table 6-2 and in Section 6.3. In total, the planned PMAs are expected to provide more than 80 taf/yr in gross average annual benefits at full implementation by offsetting groundwater pumping, providing direct recharge, and otherwise supporting groundwater sustainability. These benefits are expected to address potential sustainability concerns in the projected future conditions water budgets, even under the effects of 2070 CT climate change (Table 6-1). Planned PMAs are expected to help the GSAs achieve the sustainability goal for the Subbasin and avoid reaching the minimum thresholds defined in this GSP under future, changing conditions.

an annual basis, which represents the estimated total cost of GSP implementation. Section 7.5 describes the implementation schedule for GSP activities. Section 6 provides a concise overview of financing and funding mechanisms that provides the basis for how the GSAs plan to cover GSP implementation costs and Sections 7.7, 7.8, and 7.9 describe the required elements for the GSP annual reporting, periodic (five-year) evaluations, and features of the DMS.

7.1 GSA COSTS FOR GSP IMPLEMENTATION

Total GSP implementation costs include both PMA-specific costs and costs for the CGA and GGA to administer and support all other aspects of the GSP. GSP implementation costs will include costs for managing the GSP, planning and studies, monitoring, and providing general administration.

Estimated GSA costs for GSP implementation are split into the following four categories:

- **GSA Administration**. General costs for GSA operations including meetings, coordination, outreach, legal, accounting, and other services that are required to support GSP implementation and updates.
- **GSP Studies**. Technical evaluations that are required for GSP implementation. These include addressing data gaps, updating groundwater information to satisfy GSP Regulations, and studies that are required to evaluate and manage the Subbasin to achieve the sustainability goal.
- **GSP Updates**. GSP updates includes annual reports and five-year periodic evaluations. These are required under the GSP Regulations, as described in detail under Section 7.6 and 7.7.
- **GSA Contingency**. An additional contingency is included to cover unanticipated legal costs and other unanticipated cost associated with GSP implementation.

The following subsections describe the general types of required activities and costs for each of the GSA cost categories.

7.1.1 GSA Administration

Administrative costs generally include meetings, reporting, record keeping, bookkeeping, legal, continued outreach to stakeholders, and government relations. GSAs will also need to continue to monitor projects and management actions to assess their benefit, feasibility, and coordinate with stakeholders and water managers if modification of projects and management actions is necessary to ensure the Subbasin meets the sustainability objectives.

GSAs will implement programs to monitor groundwater, measure elevations, and track total water use to satisfy reporting requirements in the GSP Regulations. Monitoring activities may include data management, installing monitoring wells, maintaining existing wells, and initiating studies to support GSP implementation. Other activities may include data collection for both groundwater and water quality monitoring networks.

GSAs will oversee the groundwater monitoring programs outlined in Chapter 4. This will include tracking Subbasin conditions and sustainability indicators. Data from the monitoring programs will be routinely evaluated to ensure progress is being made toward sustainability or to identify whether undesirable results are occurring.

GGA and CGA administrative costs are based on the existing rate studies[1] adopted by each GSA in 2018 and a review of audited financial statements for fiscal year 2020 (year ended June 30, 2020). Audited financial statements for fiscal year 2021 are not currently available as of the publication date of this GSP (December 2021). The rate studies covered the five-year period spanning fiscal years 2019/20 through 2023/24 and were prepared as property-related fees for water service under Proposition 218. The estimated annual operations (administration) expenses are approximately $465,000 for the CGA and up to $550,000 in the GGA.

7.1.2 GSP Studies

During the GSP development process, various data gaps were identified, in addition to areas where additional studies will be needed to support refinements to the GSP. This includes planning and technical studies that will be required to meet the annual and five-year reporting requirements under 23 CCR §356.2 and §356.4. It is anticipated that many of the studies to support GSP implementation—particularly those that affect sustainable management criteria in future revisions to the GSP—would be conducted in the same public and transparent process with which the GSP was prepared. These studies are described below.

Table 7-1 summarizes the technical studies to support GSP implementation. A total of15 studies have been identified. Many of the studies listed focus on filling data gaps associated with monitoring networks. This includes developing a well inventory and registration program. The studies and estimated costs are described in detail in the following subsections.

Table 7-1. Summary of GSP Implementation Studies

Study	Description
Expand Shallow Groundwater Level Monitoring Network	To expand the shallow groundwater monitoring network, additional monitoring wells must be evaluated. This includes existing monitoring wells and suitable locations for the construction of new monitoring wells.
Expand Water Quality Monitoring Network	This study will evaluate and expand additional groundwater quality monitoring wells.
Colusa Subbasin Western Boundary Investigation	This study will evaluate data to better understand the physical characteristics and groundwater conditions of the principal aquifer along the western margin of the Subbasin.
Westside Streams Monitoring Program	Streams originating from the Coastal Range west of the Subbasin will be evaluated for potential recharge volumes, water quality, and the interconnectedness of the streams and the groundwater system within the Subbasin.
Groundwater Well Monitoring Program	This pilot program will evaluate the costs and benefits of continuous groundwater monitoring data collection via six irrigation production wells. Program expansion throughout the Subbasin will be considered based on the data utility and costs of the pilot program.
Groundwater Financial Incentives Investigation	This analysis will quantify the total costs of groundwater use and switching to surface water. The analysis will also identify grower financial incentives for in-lieu recharge and options for structuring those incentives.

[1] Fee Study for the Glenn Groundwater Authority, May 2019 and Fee Study for the Colusa Groundwater Authority, May 2019.

Table 7-1. Summary of GSP Implementation Studies

Study	Description
CV2SimFG-Colusa Model Updates and Enhancement	This program will implement the periodic model data updates necessary to adequately represent near-term and future conditions within the Subbasin, and to support annual and five-year periodic GSP reporting to the DWR.
Well Inventory Program	This program will inventory the estimated 20% of groundwater wells unaccounted for within the Subbasin, and would seek to identify wells that are no longer active.
Well Registration Program	This study will evaluate the potential of a program for landowners to inventory their well data. This will complement the well inventory program.
Increasing GSA Involvement in County Well Permitting and Land Use Planning	CGA and GGA will explore options for allowing GSA input to the counties' well permitting processes and land use planning. The objective of GSA input would be to ensure that wells are permitted and land uses are planned in a manner consistent with sustainable groundwater management according to the GSP.
GSA Coordination with Water Quality Coalitions and Regulatory Agencies	GSAs will coordinate with the various water quality coalitions, water stakeholders, and regulatory agencies regarding GSP and other regulatory program implementation. This will include helping to identify and address water quality problems across the Subbasin, including those affecting disadvantaged communities (DACs) and severely disadvantaged communities (SDACs), and consideration of opportunities to expand public water systems and consolidate small public systems to improve drinking water quality delivered to DACs and SDACs.
Sutter Buttes Rampart Water Quality Interbasin Working Group	The CGA, GGA and the GSAs in the Butte, Sutter, Yolo, North Yuba and South Yuba Subbasins should participate in an interbasin working group focused on collaborative discussions, consensus-building and planning to address groundwater quality matters associated with the unique geology of the Sutter Buttes area.
Participation in Interagency Drought Task Forces	The CGA and GGA should coordinate their responses to droughts with their respective county and state agency partners through existing Interagency Drought Task Forces established in each county by the Colusa and Glenn County Boards of Supervisors.
Sacramento Valley Subsidence Interbasin Working Group	The CGA and GGA should consider participating in a Sacramento Valley Subsidence Interbasin Working Group with DWR, the other GSAs in the Sacramento Valley and federal partners. The working group would provide a forum for collaborative discussions, consensus-building, and planning to address inelastic land subsidence in the Sacramento Valley.
Evaluate Infrastructure Sensitivity to Subsidence	This study will evaluate the sensitivity of infrastructure in the Subbasin to potential subsidence rates.

7.1.2.1 Expand Shallow Groundwater Level Monitoring Network

The shallow groundwater monitoring network will be used to monitor groundwater levels and groundwater quality of the unconfined portion of the principal aquifer. Additionally, groundwater levels in shallow groundwater monitoring wells within five miles of major surface water features will be used to monitor stream-aquifer interactions and groundwater dependent ecosystems (GDEs). Understanding the flow relationships between the shallow groundwater aquifer and surface waters can assist in evaluating any possible occurrences of surface water depletions or riparian habitat. Monitoring wells with multiple completions (i.e., boreholes with more than one well casing installed, each casing screened at different depth intervals, and sealed between screens) can be used to characterize aquifer properties such as vertical hydraulic conductivity and transmissivity. Better understanding the flow mechanics of the

Staff Report

To: CGA-GGA Joint TAC

Agenda Item: 10. Drought Update

Date: July 8, 2022

Background

The ongoing drought and declining groundwater levels have created challenges in groundwater management for GSAs and other local agencies. The drought conditions have affected all beneficial groundwater users throughout the Colusa Subbasin.

Counties, GSAs, and others may share drought-related information including conditions, mitigation measures, pending actions, and similar topics to create a shared understanding of the impacts to the stakeholders in the Colusa Subbasin.

Recommendation

No action necessary. Updates only.

Attachments

- None