Response to Questions

Madera County Groundwater Sustainability Agency

Measurement Services

July 18, 2025

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July 18, 2025

Madera County Groundwater Sustainability Agency
200 West Fourth Street
Madera, CA 93637

Subject: Response to Questions for RFP/Proposal for Madera County Groundwater Sustainability Agency Measurement Services

Dear Ms. Allen:

Land IQ, LLC appreciates the opportunity to provide additional information for your consideration in response to the solicitation for Madera County Groundwater Sustainability Agency Measurement Services.

Should you have additional questions, please feel free to contact us at any time while reviewing this document. We greatly look forward to the potential opportunity of leveraging our multiple decades of experience through this critical effort.

Sincerely,

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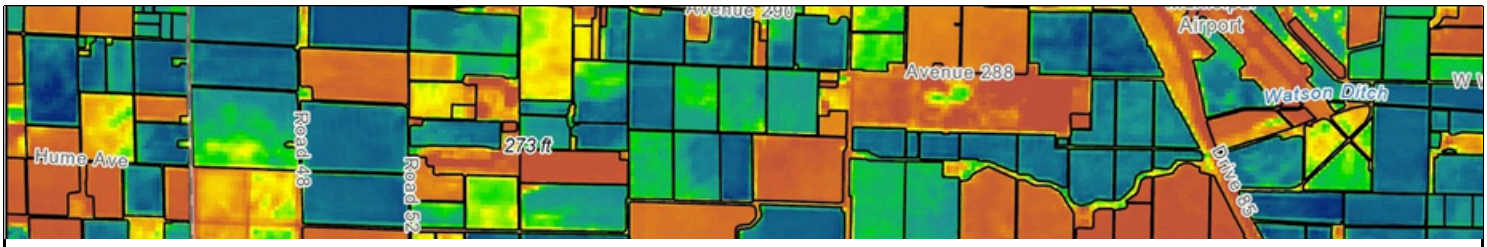


Questions

1. QA/QC

What processes are in play for quality assurance and quality control for data?

The Land IQ ET product has numerous QA/QC steps throughout the process, beginning with the station data, which is what differentiates Land IQ from other measurement services. The purpose of these stations is to calibrate to actual field conditions and independently validate results.

Land IQ stations are maintained at least once a month by trained Land IQ staff and are fully telemetered by cellular communication systems to Land IQ servers. Data collection incorporates data flagging protocols to identify any inconsistencies or outages. A thorough QA/QC effort is conducted on all field collected data prior to using in the data-driven remotely sensed analysis.

Quality control is also performed on the estimated ET results. This included a qualitative assessment of results to identify anomalies, and a quantitative assessment of statistical and spatial distribution patterns in both input features and model predictions. The qualitative assessment includes an agronomist review of 100 fields that remain the same throughout the year and 100 fields that are selected randomly each month.

Statistical metrics including coefficient of determination (r^2) and root mean square error (RMSE) between predicted ETa and measured ETa were used as the criteria to evaluate the performance of monthly ET models. Additionally, two randomly selected stations were excluded from the entire modeling process every month for independent validation for the last 3.5 years.

2. Data Security

How do you make sure that your data is securely shared and stored?

Data security and grower confidentiality is of utmost importance to Land IQ. As such, we require both the GSA and any consultants working with the data to sign Product and End User License Agreements to prevent the sharing of data outside the intended purpose and use of the GSA.

Any data delivered to the GSA is through a password protected web application. Land IQ routinely checks the application to ensure only those with issued passwords are accessing data. All data are stored on secure Land IQ servers. Land IQ servers are backed up offsite on a daily basis for secure data recovery if ever needed.

Grower access to the daily irrigation management tool is also password protected, where growers are only allowed to see the fields they own/manage and have claimed.

3. Mobile Apps

Does your product have a mobile applications or interface?

The Land IQ ET Web Application and Daily Irrigation Management Tool are not not mobile applications, however they can be viewed on mobile devices.

4. Use by Other GSAs

Please list any other Groundwater Sustainability Agencies (GSAs) using your products.

The Land IQ ET is currently being used on over 3.5 million acres in the following GSAs/Irrigation Districts:

Vina Subbasin
Rock Creek Recalamtion District GSA
Vina GSA

Sutter Subbasin
Sutter Mutual Water Company

Turlock Subbasin
East Turlock Subbasin GSA
West Turlock Subbasin GSA
(Turlock Irrigation District)

Chowchilla Subbasin
Madera County GSA

Kings Subbasin
North Fork Kings GSA

Tulare Lake Subbasin
Mid Kings River GSA
South Fork Kings GSA
Southwest Kings GSA
Tri County Water Authority GSA

Tule Subbasin
Alpaugh Irrigation District GSA
Rock Creek Recalamtion District GSA
Dealno Earlimart Irrigaton District GSA
Eastern Tule GSA
Lower Tule River Irrigation District GSA
Pixley Irrigation District GSA

Kaweah Subbasin
East Kaweah GSA
Greater Kaweah GSA
Mid Kaweah GSA (Tulare Irrigation District)

Kern Subbasin
Kern Groundwater Authority GSA

- Arvin Edison Water Storage District
- Buena Vista Water Storage District
- Cawelo Water District
- Eastside Management Area
- Kern Delta Irrigation District
- Kern Tulare Water District
- North Kern Water Storage District
- Olcese Water District
- Rosedale Rio Bravo Water Storage District
- Semitropic Water Storage District
- Shafter Wasco Irrigation District
- Southern San Joaquin Municipal Utilities District
- Westside Water Authority
- Wheeler Ridge Maricopa Water District

White Wolf Subbasin
White Wolf Subbasin GSA

Paso Robles Subbasin
Paso Robles Subbasin GSA

5. NOAA

Are any of your satellites/data collection capabilities affected by the loss of weather prediction in NOAA data?

The Land IQ ET process is not affected by the loss of weather prediction in NOAA data.

Land IQ utilizes commercially available satellite data including Landsat 8, Landsat 9, and Sentinel.

Land IQ collects ground truth information from climatic stations that are built and maintained by Land IQ.

6. Crops

Is there a list of crops covered by either the ET data collection or platform service? If so, can the public see it?

The Land IQ ET measurement method covers all crop types. As a part of the deliverables, Land IQ conducts crop mapping within 4-5 months of the end of the water year. This information is prepared in advance of the mapping Land IQ conducts for the California Department of Water Resources each year. This information is publicly available and can be viewed at https://gis.water.ca.gov/app/CADWRLandUseViewer/. Land IQ maps approximately 60 different crops, including all crop types existing within the Madera County GSA. The crop type information is used for the purpose of assessing ET results by individual crop type rather than across the landscape with all crop types grouped together. This allows for more specificity on crop by crop ET.

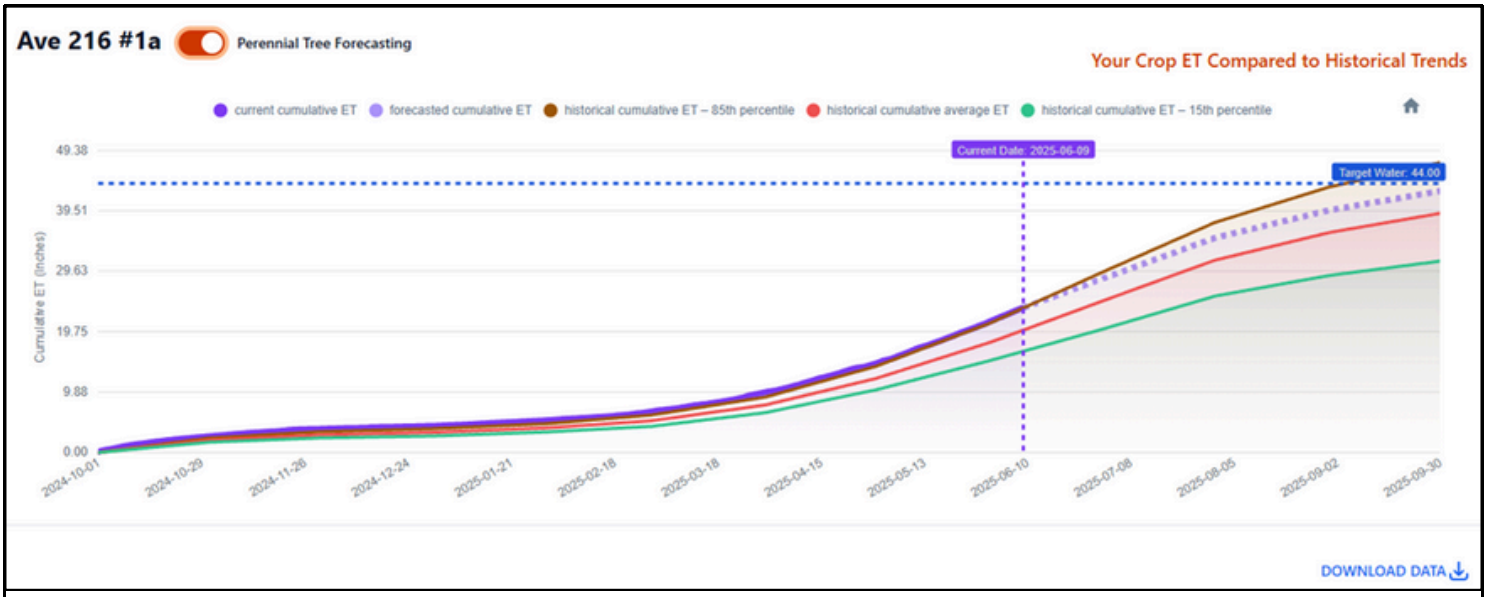
7. Grower Accessible Platform

Land IQ did not propose on a groundwater accounting platform, however as a part of the proposal, we do offer a grower accessible daily irrigation management tool.

a. Does the platform have the ability to aggregate ET data over unique geospatial polygons provided by the GSA (fields)?
The daily irrigation management tool allows for growers to select and view ET results on a field level for all claimed fields.

b. Does the platform have the ability for growers and /or the GSA to combine field polygons into larger management groups (farm units)?
The daily irrigation management tool does not allow a grower to combine fields on a management unit basis, however, a grower can download all fields and the ET and precipitation data to understand use on a field-by-field management unit basis. Individual fields can always be grouped together to construct farm units. Land IQ can also ingest the existing farm unit layer and modify the grower tool accordingly.

c. Does the platform have the ability to display and compare groundwater allocation amounts to current groundwater use (budgets) by farm unit or grower account?
Yes, the daily irrigation management tool allows growers to track their consumptive use against a groundwater allocation set by a district-, GSA-, or grower-defined threshold.



d. Does the platform have the ability to incorporate allocation adjustments provided by the GSA (recharge credits, surface water credits, carryover)?

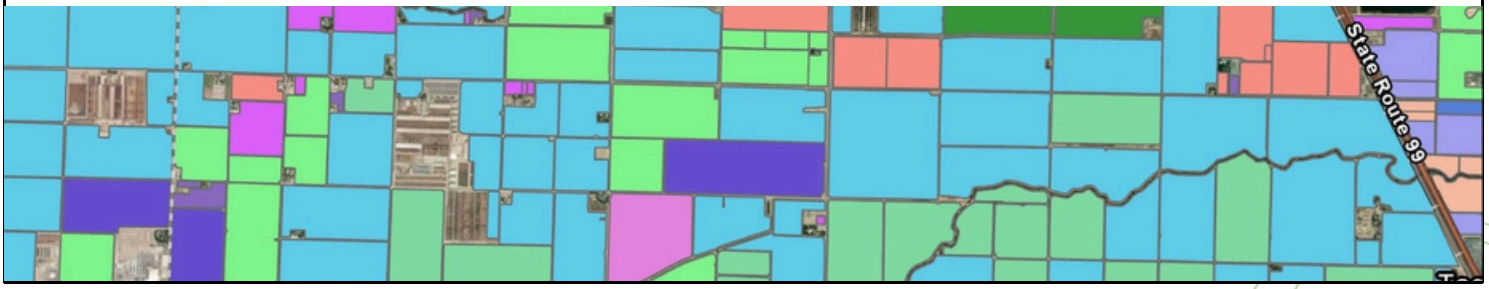
Although Land IQ is not proposing on the classic allocation platform portion of the RFP, the daily irrigation management tool can be modified to include credits towards a threshold target consumption value as explained previously.

e. Does the platform have the hold grower-uploaded, geotagged photos?

While Land IQ did not propose on the classic allocation platform portion of the RFP, if needed, the daily irrigation management tool can be modified to ingest grower-uploaded, geotagged photos because every grower within the GSA will have an account that tracks their daily crop consumptive use which could be compared to geotagged photos of applied water meter readings, for example.

f. Explain why your platform is the best.

Land IQ listens and responds to grower and GSA priorities. Growers trust and rely on our 30-day ET deliverables, however, expressed an interest in daily ET and precipitation results delivered near-real time. In response, Land IQ developed the grower-level, field-by-field, daily ET product portal (daily irrigation management tool) in which a grower/operator can only view their fields. To complement the grower tool, there is also a manager level-portal, that allows the GSA/District manager to view all fields. For consistency, the results of the daily product will match the proven results of the 30-day ET results that are currently provided to Madera County GSA and its growers. The goal is to allow growers to track their water use on a daily basis in relation to a district-, GSA-, or grower-defined threshold. The grower can then adjust water management actions during the year on a real time basis to approach, but not exceed this threshold.



8. ET Data

a. Does your service calculate for ET? ETAW? If so, how does the calculation work (and why do you think it's the best). If not, where does the data come from?

The Land IQ ET model calculates ET and was developed for detailed, field-scale water use tracking. In addition to ET, Land IQ delivers field level precipitation and crop type. ETAW can be calculated by subtracting out an estimate of the contribution of ET provided by precipitation from the total ET. Land IQ's field-by-field precipitation is measured by our station network and other trusted precipitation measurement resources.

The Land IQ ET model is differentiated from other models by the following:

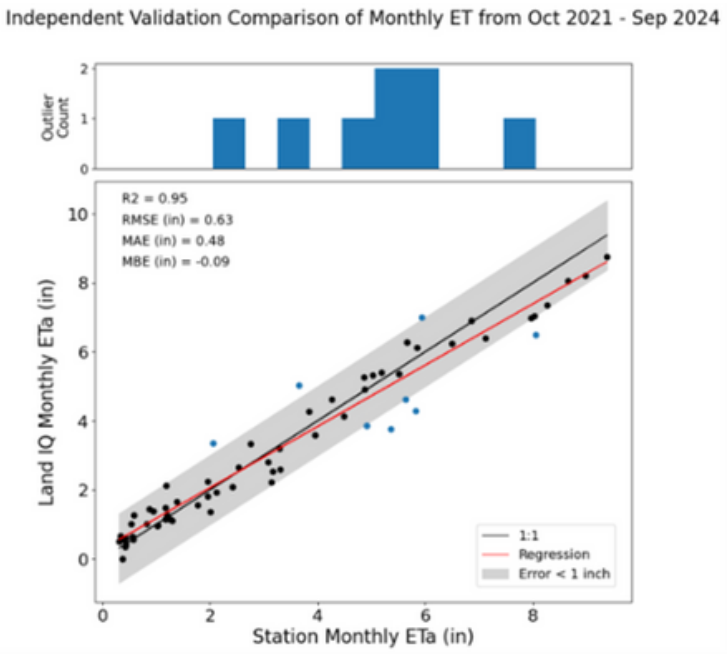
- **Data-driven** - The data driven approach makes the model completely objective. There is no need to hand-pick calibration pixels, as required in other models, which can introduce uncertainty, depending on an analyst's knowledge and experience. This data driven model uses a network of robust ground station data and direct image analysis to interpret image data.
- **Ground truth distribution/validation data** – The Land IQ model integrates data from repeated and rigorous ground truth weather stations (currently 95 statewide). Field stations are distributed to correspond with the range and dominant crop types in the service area and are continuously monitored via telemetered systems to detect inconsistencies in collection or outages. Field station data is key for model calibration and to validate model accuracy.
- **Scale** – Modeling is performed at the field level; thus, results can be aggregated to any larger unit of analysis desired.
- **Remotely sensed imagery** - Land IQ ET uses available remotely sensed images (Landsat 8 and 9, Sentinel, other purchased imagery, if needed). Typically, the model uses up to three times the imagery as compared to Landsat 8 alone.
- **Integration of agronomic features of modern cropping systems** - Unlike other methods, the Land IQ land use data is derived from and guided by our understanding of agricultural systems, landscape processes, production systems, and crop phenology. In addition to basic land use data, the Land IQ ET model also considers and incorporates permanent crop age, permanent crop density, and unique field conditions including irrigation method and management.

b. Can your firm's ET data be integrated into a groundwater accounting platform?

Yes, the Land IQ ET data is currently being utilized by all known platforms including Basin Safe (developed by 4 Creeks and used in the Tule Subbasin), Watermark (developed by MLJ Environmental and used in the Kings Subbasin), the Groundwater Accounting Platform (developed by California Water Data Consortium and Environmental Science Associates and used in the Kern Subbasin), and the Water Dashboard (developed by Agri Tracking and used in the Kaweah Subbasin).

c. Does your firm have the capability of providing ET data through an automated method (such as an API) to an accounting platform and at what frequency and with what delay factor?
The Land IQ data is currently delivered to GSAs and their consultants on a monthly basis. Files are available for download via the Land IQ ET web application. Land IQ provides files for all the accounting platforms and are formatted for easy ingestion.

d. What is the expected accuracy of your calculation of ETAW, including its margin of error? Explain how the accuracy figure is calculated. Feel free to discuss "absolute accuracy" and accuracy relative to others. Quantify the improved accuracy.
Land IQ utilizes multiple methods for evaluating model accuracy. One method is an independent validation of model results, using the data from two stations per month over the past 3.5 years. The stations are randomly selected for exclusion from model calibration data.



c. What details can be shared on how the data is validated?
The second method of evaluating model accuracy was by comparison of model results to growers' applied water records as a validation. Grower irrigation flowmeter data was obtained for over 170 orchards (almonds, citrus, and pistachios) in the Southern San Joaquin Valley annually for WY 2022 – 2024 and was compared to ET model results. To evaluate accuracy, the total received water for the orchard (irrigation plus precipitation) was compared against model ETa.