TECHNICAL MEMORANDUM

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TO:	IWV GA	DATE:	November 28, 2018
FROM:	Stetson Engineers, Inc.	JOB NO:	2652-001: 08.03

RE: Assessment of Wellntel October 31, 2018 Proposal and Comparison to Stetson Recommended Datalogger and Telemetry System to Support IWV GSP

The Groundwater Sustainability Plan (GSP) will require up to 44 water level monitoring locations to measure groundwater levels throughout Indian Wells Valley. Real-time monitoring of groundwater pumping is not required to assess whether thresholds or sustainability goals are being met. Instead, groundwater pumping will be reported on an annual basis to assess pumping and periodically update the GA's numerical groundwater model, in addition to other management-based objectives. The purpose of this memorandum is to assess the October 31, 2018 proposal from Wellntel to provide automated community-based groundwater-level monitoring network for the Indian Wells Valley Groundwater Basin. The Wellntel system is compared to the previously approved datalogger and telemetry system proposed to the GA by Stetson Engineers.

The Wellntel product provides real-time access to continuous groundwater-level data through web- and remote-based access. Web-based access is provided through existing routers and ISP connections located within 2,000 feet line-of-site to the well; remote-based access it provided via the existing cellular network. While there is no additional fee or cost associated with using existing routers located in homes and businesses, the Wellntel system would require additional costs for cell-based telemetry and associated data plans for wells outside of existing wifi networks.

In order to provide a comparison to the equipment and installation costs previously provided to the GA Board by Stetson, the following memorandum addresses the requirements for installing 44 groundwater-level monitoring devices throughout the groundwater basin. The original October 31, 2018 Wellntel cost proposal for 125 well installations has been reduced to 44 to match GSP requirements. Any additional installation of real-time monitoring devices would be outside the requirement of the GSP and related scope of services and are not addressed in this analysis.

The primary differences between the Wellntel and Stetson proposals are cost and data redundancy. The Wellntel system is less expensive to install when compared to the Stetson proposal, but requires higher annual operation and maintenance costs over time. The Stetson system includes data redundancy through the installation of a well-based datalogger, which is not provided in the Wellntel system. Both systems transmit and store data in the cloud, so data manipulation, storage, and displays are functionally identical. A comparison of the two systems are provided in the following table

FEATURES AND DETAILS OF THE WELLNTEL AND STETSON GROUNDWATER-LEVEL MONITORING PROPOSALS

	Wellntel	Stetson
Up-Front Capital Costs	Low	High
Operational Costs	High	Low
Annual Data Cost per Well	Yes	n/a
Range to ISP Connection	2,000 Feet	n/a
Remote Installation Availability	Yes	Yes
Range to Master Station	1 mile	8 miles
Wellhead Data-logger	n/a	Yes
Sounder	Acoustic	Pressure
Data Stored in Cloud	Yes	Yes
Web-Based Dashboard and GSP Tracking	Yes	Yes

n/a indicates not an available option

The details of each system outlined in the above table only describe the general characteristics of the two systems. The Wellntel system incorporates an acoustic sensor mounted at the top of the well that requires a battery to produce a pulse to measure travel time to water surface and convert to depth to water, then transmit the resulting information to the ISP/Router hub for transmission to the cloud. The battery lasts less than 12 months when the sensor is being used to assess pumping volumes and as long as 24 months when a less frequent sample interval is set to only measure for static water levels. The Stetson system incorporates a pressure transducer, which includes a datalogger, set at some discrete depth below the water level in the well. The battery in the pressure transducer records the weight of the water and air column above the transducer and sends the information to a radio mounted atop the well that transmits the data to a master station. The master station connects up to 6 “slave” wells and transmits the information to the cloud via cell or satellite signal. The battery in the transducer typically lasts 10-years, while the radio is powered by a solar panel and storage battery.

The capital and annual costs are considerably different for the two systems as shown in the following table that details the total 10-year cost of monitoring 44 wells for static water levels. The total cost over 10 years using the Wellntel system is $3,884 per well compared to $3,306 per well for the Stetson system. While capital costs are much lower to install the Wellntel system,

the annual costs are considerably greater. The difference in capital costs are primarily attributed to Wellntel's use of existing ISP/router locations and lack of datalogger capabilities. The Stetson system relies on installation of master transmitter stations at specified wells that support up to six (6) remote "slave" stations. Master transmitter stations can be either cell or satellite systems based on topographic and cultural constraints.

COMPARISON OF CAPITAL AND ANNUAL O&M COSTS FOR THE WELLNTEL AND STETSON GROUNDWATER-LEVEL MONITORING SYSTEMS TO MONITOR 44 WELLS

Cost	Wellntel	Stetson
Capital Costs		
Commissioning and Well Assessment	17,925	8,800
Equipment Cost for 44 wells	30,712	108,672
Allowance for Adaptation to Well	6,037	8,800
TOTAL CAPITAL COSTS	$54,674	$126,272
Annual Costs		
Data Services per well ($168/year/well)	7,392	0
Battery Replacement (2-year life)	1,320	0
Sounder Replacement (2-year life)	990	0
Cell Data Costs for 8 stations	1,920	1,920
TOTAL ANNUAL COSTS	$11,622	$1,920
10-Year Annual Cost	$116,220	$19,200
Capital and 10-Year Annual Cost	$170,894	$145,472
10-Year Total Cost Per Well	$3,884	$3,306

Notes:

All values based on 2018 costs not including inflation.

Wellntel estimated costs for 44 wells prorated based on Oct 31, 2018 estimate for 125 wells for the following:

- 50% of commissioning and well assessment (35,850)
- 35% of Equipment ($87,250)
- 35% of Allowance of Adaptation ($17,150)

Stetson System based on 8 master and 36 slave stations.

Many factors affect the use of groundwater level data for monitoring thresholds and meeting sustainability goals that will be required in the GSP. The recent DRAFT Monitoring Protocols and Reporting Standards for Indian Wells Valley Groundwater Authority's Groundwater Sustainability Plan (Stetson Engineers, Oct 26, 2018) identifies data requirements for groundwater-level monitoring wells. The monitoring wells included in the GSP will sample from the different aquifers in the Indian Wells Valley and will be restricted to non-pumping

CASGEM, or similar type monitoring wells. Although the purpose of this memorandum was not to compare differences between acoustic (Wellntel) and pressure (Stetson) transducer technologies, Stetson has been using pressure transducers for over 20 years with reliable and repeatable results.

Based on the comparison between Wellntel's and Stetson water-level telemetry systems, Stetson recommends the following:

1. Continue with installation of previously approved Stetson datalogger and telemetry system for wells used to support GSP sustainability thresholds and goals.

2. Develop a data portal in IWV DMS for non-GSP related data to be uploaded and viewed by Wellntel users.

The recommendations to use the Stetson system is based on lower overall 10-year costs, inclusion of datalogger for redundancy if telemetry fails, longer 10-year battery life of sounder, and lower annual maintenance requirements. The Wellntel system could be useful for reporting private non-diminimus pumping not related to the IWV GA's effort to develop the GSP. While these pumping records would not be part of the GSP, data collected from monitoring private wells could add useful hydrogeologic data for the IWV Basin and may reduce GA administrative costs for reporting pumping. Data from the Wellntel system could be included in the DMS and shown on a separate web-page. If requested, a cost analysis for operating the Wellntel system to monitor and report non-diminimus pumping could be performed.