MONITORING PLAN
LAKE COUNTY, CALIFORNIA
by
LAKE COUNTY WATERSHED PROTECTION DISTRICT

CALIFORNIA STATEWIDE GROUNDWATER ELEVATION MONITORING SYSTEM

March 20, 2012

Overview

Bulletin No. 118 has identified thirteen groundwater basins in Lake County. Pursuant to the California Statewide Groundwater Elevation Monitoring System (CASGEM), the Lake County Watershed Protection District (District) will serve as the Monitoring Entity for all of Lake County. The District is a local monitoring entity pursuant to Water Code Part 2.75. The District boundaries are the same as the County of Lake and include all thirteen groundwater basins in their entirety. The groundwater basins are shown in Table 1.

Table 1: Lake County Groundwater Basins

Basin ID	Basin Name	Currently Monitored
1-48	Gravelly Valley	N
5-13	Upper Lake Valley	Y
5-14	Scotts Valley	Y
5-15	Big Valley	Y
5-16	High Valley	Y
5-17	Burns Valley	Y
5-18	Coyote Valley	Y
5-19	Collayomi Valley	Y
5-30	Lower Lake Valley	N
5-31	Long Valley	N
5-66	Clear Lake Cache Formation	N
5-93	North Fork Cache Creek	N
5-94	Middle Creek	N

The District has cooperatively measured water levels in wells in the identified groundwater basins since the early 1960s in cooperation with the California Department of Water Resources (CDWR). The District currently measures 85 wells semiannually (April and October) in seven of the groundwater basins, see Figure 1. Monthly monitoring of wells in Big Valley has confirmed that this monitoring schedule usually catches the high and low groundwater levels for the season. Some of these wells will be utilized as monitoring wells for CASGEM. Wells are selected to reflect trends in groundwater levels within the groundwater basins which provide a majority of the groundwater within Lake County.

Well Selection

Groundwater use for each groundwater basin were estimated. The average annual water demand was estimated as follows:

- Irrigation demands for surface and groundwater were estimated based on the data in the CDWR Land Use survey of 2001 and irrigation rates from the Lake County Water Demand Forecast, March 2006, prepared for the District (Demand Forecast)..
- The average annual public water supply demand was estimated based on data submitted to CDWR by water purveyors in Lake County as presented in the Demand Forecast.

- Domestic rural demand was estimated using the 2000 Census block data and per capita water use data from the Demand Forecast.

The estimates of groundwater use and total water use are show in Table 2. Detailed calculations and the procedures for developing these estimates are included in Appendix A.

Table 2: Estimated Water Demand

BasinID	Groundwater Basin	Total Acres	Total Groundwater Demand	Total Water Demand	Percent Irrigation	Percent of Groundwater Demand	Percent of Total Water Demand
1-48	Gravelly Valley	2,976	6	6	0.0%	0.0%	0.0%
5-13	Upper Lake Valley	11,612	4,069	10,527	97.8%	12.2%	17.9%
5-14	Scotts Valley	7,312	3,864	4,323	80.6%	11.6%	7.4%
5-15	Big Valley	24,868	14,841	15,150	92.8%	44.5%	25.8%
5-16	High Valley	2,428	61	61	82.2%	0.2%	0.1%
5-17	Burns Valley	2,352	178	183	52.8%	0.5%	0.3%
5-18	Coyote Valley	5,095	2,079	2,566	73.6%	6.2%	4.4%
5-19	Collayomi Valley	6,946	632	828	73.7%	1.9%	1.4%
5-30	Lower Lake Valley	2,769	316	316	11.9%	0.9%	0.5%
5-31	Long Valley	2,801	279	279	92.6%	0.8%	0.5%
5-66	Clear Lake Cache Formation	29,448	171	191	70.9%	0.5%	0.3%
5-93	North Fork Cache Creek	3,476	0	0	0.0%	0.0%	0.0%
5-94	Middle Creek	443	183	183	89.3%	0.5%	0.3%
Subtotals		**102,524**	**26,678**	**34,612**	**89.8%**	80.0%	**58.9%**
Groundwater Source Area							
Clear Lake Pleistocene Volcanics		64,701	3,860	4,782	85.0%	11.6%	8.1%
Remainder		683,618	2,824	19,338	69.4%	8.5%	32.9%
County Total		**850,843**	**33,362**	**58,732**	**82.7%**	**100.0%**	**100.0%**

Groundwater use from the identified groundwater basins account for 80.6 percent of the countywide groundwater use within the county. Groundwater usage from all identified basins is approximately 45.8 percent of all water used within Lake County.

The monitored basins account for 77.5 percent of the countywide groundwater use, and 96 percent of the groundwater use within the identified groundwater basins. The District is proposing to submit monitoring data to CASGEM for the groundwater basins which it currently monitors. The District is not proposing to include the unmonitored basins. Following is a discussion of why six of the groundwater basins within the County are not proposed to be monitored.

<u>Gravelly Valley, 1-48:</u> Gravelly Valley is a small basin in the northern portion of Lake County. Land use in the basin is primarily rural residential and open space. The residential property is bounded by the Mendocino National Forest on the west, north and eastern sides, with the southwestern edge bordering a Lake Pillsbury, a reservoir owned and operated by PG&E. Many

of the homes are vacation homes, with a year round population of 39 (2000 Census). There is no agricultural irrigation, with groundwater use limited to residential demand and providing water to a couple campgrounds. Groundwater demand is estimated a 6 acre-feet per year, or 0.02 percent of the groundwater demand in the County. There have been no reports of declining groundwater levels in the basin.

Lower Lake Valley, 5-30: Lower Lake Valley is a long narrow basin located at the southeast end of Clear Lake. Land use is primarily rural residential, with some limited agricultural uses (46 acres or 1.7 percent of the basin area). The primary use of groundwater in the basin is the Lower Lake County Water District, which accounts for 68 percent of the groundwater use. The total groundwater demand is estimated at 316 acre-feet per year, or 0.9 percent of the groundwater demand in the County. There have been no reports of declining groundwater levels in the basin.

Long Valley, 5-31: This groundwater basin is a narrow alluvium in the eastern part of Lake County. The area is primarily rural residential and low intensity agriculture (pasture, hay, etc) and includes the subdivision of Spring Valley. Spring Valley is served by a public water supply which obtains water from the underflow of the North Fork of Cache Creek. The groundwater demand is estimated at 279 acre-feet per year, or 0.8 percent of the groundwater demand in the County. There have been no reports of declining groundwater levels in the basin, with the exception

Clear Lake Cache Formation, 5-66: The Cache Formation consists of a mixture of alluvial and lacustrine deposits covering covering the eastern portion of the County. Over 49 percent of the basin is overlain by government property, a significant amount of which is Federally Designated Wilderness Area. Land use is primarily open space, with scattered rural development and limited agriculture. A portion of the City of Clearlake overlies the western edge of the basin, however, the primary water supply is from Clear Lake. The groundwater demand is estimated at 171 acre-feet per year, or 0.5 percent of the groundwater demand in the County. There have been no reports of declining groundwater levels in the basin.

North Fork Cache Creek, 5-93: This groundwater basin is entirely publically owned and is the site of Indian Valley Reservoir, a 300,000 acre-foot water supply reservoir. There are no wells within the basin.

Middle Creek, 5-94: This groundwater basin is a narrow alluvium bounded by parallel ridges. The valley floor and adjacent areas are developed as rural residential with a few irrigated pastures. Total groundwater demand is estimated at 183 acre feet per year, or 0.5 percent of the groundwater demand in the County. There have been no reports of declining groundwater levels in the basin.

CASGEM monitoring is proposed for the following basins.

Upper Lake Valley, 5-013: The basin consists of alluvial deposits in four distinct areas: Middle Creek Valley (including the Upper Lake area), Clover Valley, the Reclamation Area, and Bachelor Valley, see Figure 2. Total groundwater demand is estimated at 10,527 acre feet per

year, or 12.2 percent of the groundwater demand in the County. Monitoring wells must be selected to reflect the different recharge sources and hydrogeology of these four areas.

- A majority of the irrigated agriculture, as well as the Upper Lake water supply wells, are in the Middle Creek Valley. Two monitoring wells will be submitted for this area. Wells selected are: 16N-09W-31C3 and 15N-09W-06K1. Well locations are shown in Figure 2 and detailed information on each well is included in Appendix B.
- One well, 15N-09W-09L1, will be monitored in Clover Valley. Well locations are shown in Figure 2 and detailed information on each well is included in Appendix B.
- The Reclamation Area is primarily served by surface water supplies, with most of the wells being domestic wells. Groundwater use is very limited. The District proposes to monitor one well, 15N-09W-18H3, in the area. Well locations are shown in Figure 2 and detailed information on each well is included in Appendix B.
- Bachelor Valley has limited irrigated agriculture. The District proposes to monitor one well, 15N-10W-03D1, in the area. Well locations are shown in Figure 2 and detailed information on each well is included in Appendix B.

- Scotts Valley, 5-14: The basin consists of alluvial and lacustrine deposits. The terrace deposits beneath and west of the City of Lakeport have limited groundwater use. A majority of the developed areas near the Clear Lake shoreline are served by either the City of Lakeport water system or the County Service Area 21 water system. The majority of the irrigation and the City of Lakeport's well field are in the western portion of the basin in the valley floor near Scotts Creek in the geographic area known as Scotts Valley. Total groundwater demand is estimated at 3,864 acre feet per year, or 11.6 percent of the groundwater demand in the County. We have selected two wells for monitoring, 14N-10W-14E2 and 14N-10W-11G1. Well locations are shown in Figure 3 and detailed information on each well is included in Appendix B.

- Big Valley, 5-15: The aquifers in Big Valley consist of a mixture of three alluvial aquifers and a volcanic ash aquifer[1]. The aquifers are hydraulically connected and behave as a single aquifer system. Wells were selected to reflect the effectiveness of different recharge areas, groundwater use, and geographic location. Groundwater demand in Big Valley is estimated at 14,841 acre-feet per year, or 44.5 percent of the groundwater demand in the County. Ninety three percent of the groundwater is utilized for irrigation, with seven percent utilized for municipal uses (Kelseyville/Finley, Corinthian Bay and Big Valley Rancheria). With the decline of the Lake County pear industry and the conversion to wine grape vineyards, irrigation amounts have declined significantly in the last 10-15 years. We have selected eight wells for monitoring:

13N-09W-07A3	14N-09W-32G2
14N-09W-34F2	13N-09W-02H1
13N-09W-03R1	13N-09W-09L1
13N-09W-22M1	13N-09W-28J2

[1] Christensen Associates, Inc., Big Valley Ground Water Recharge Investigation Update, prepared for Lake County Flood Control and Water Conservation District, May 2003

Well locations are shown in Figure 4 and detailed information on each well is included in Appendix B.

- High Valley, 5-16: The aquifer in High Valley is a mixture of alluvium and volcanic deposits. Recharge is from direct percolation and through alluvial fans bordering the valley. Groundwater demand is low, and is primarily irrigation for wine grapes. With increased vineyard development, groundwater demand is increasing. Total groundwater demand is estimated at 61 acre feet per year, or 0.2 percent of the groundwater demand in the County. We have selected two wells for monitoring, 14N-08W-24H1 and 14N-08W-23K1. Well locations are shown in Figure 5 and detailed information on each well is included in Appendix B.

- Burns Valley, 5-17: The aquifer in Burns Valley is primarily alluvium from Burns Valley and Austin Creeks. The majority of the basin is within the City of Clearlake, however, land use is primarily rural residential with large areas being walnut orchards. Along the western edge of the basin, areas are served by public water supplies, however, a majority of the area relies on individual domestic and agricultural wells for water supply. Groundwater use has decreased over the years. Total groundwater demand is estimated at 178 acre feet per year, or 0.5 percent of the groundwater demand in the County. The District only monitors one well in the basin, 13N-07W-21H1. Monitoring data from this well will be submitted. The well location is shown in Figure 6 and detailed information on the well is included in Appendix B.

- Coyote Valley, 5-18: The aquifer in Coyote Valley is primarily alluvium from Putah, Coyote and Crazy Creeks. Recharge is primarily from Putah Creek. Agricultural use is primarily irrigated pasture and wine grapes. Approximately 26 percent of the groundwater use in Coyote Valley is for municipal and domestic uses, primarily within the community of Hidden Valley Lake. The State Water Resources Control Board, Division of Water Rights determined that groundwater extracted from the Hidden Valley Lake CSD wells is "underflow" and subject to surface water right laws, although they are located as much as 2,300 feet from Putah Creek. Total groundwater demand is estimated at 2,566 acre feet per year, or 6.2 percent of the groundwater demand in the County. We have selected two wells for monitoring, 11N-06W-19P2 and 11N-06W-29M1. Well locations are shown in Figure 7 and detailed information on each well is included in Appendix B.

- Collayomi Valley, 5-19: The basin aquifers are the result of four converging streams, Long Valley, St. Helena, Dry and Putah Creeks. Recharge is primarily from the creek bottoms and direct percolation of rainwater. Agricultural use is primarily irrigated pasture and wine grapes. Approximately 26 percent of the groundwater use in Coyote Valley is for municipal and domestic uses, primarily within the community of Middletown. Total groundwater demand is estimated at 828 acre feet per year, or 1.9 percent of the groundwater demand in the County. We have selected four wells for monitoring, 10N-07W-14P2, 10N-07W-01A1, 11N-07W-35E1 and 11N-07W-33M1. Well locations are shown in Figure 8 and detailed information on each well is included in Appendix B.

Monitoring will be conducted twice each year, in early April and early October. Wells are monitored using either a steel tape or electric tape in accordance with USGS procedures[2] to the nearest tenth of a foot. The measurement method is selected based on the individual characteristics of each well. Detailed procedures are included in Appendix C.

As many of these wells have been measured since the early 1960's, the method utilized for determining the Reference Point (RP) elevation is unknown. The original well data, including RP and ground elevations, was provided by California Department of Water Resources to the District. When wells have been added to the system, i.e. 14N-09W-34F2, a level loop using standard surveying practices was run from a known elevation, i.e. benchmark, to and from the well to determine the well elevation. All elevations are currently maintained in NGVD 1929 datum. Data submitted to CASGEM will utilize the NAVD 1988 datum. Elevations were converted from NGVD 1929 to NAVD 1988 by adding 2.9 feet to all elevations.

Data is recorded in the field in a notebook on standard datasheets, see Figure 9. Upon completion of well measurements, this data is entered into a MS Access database. The database also contains well information (when known). The database is used to view the data and manipulate it into desired formats/reports. The database is maintained on the Lake County server and is backed up daily.

[2] United States Geological Survey, Office of Ground Water, Water-Level Measurement Using Graduated Steel Tape, Stand-Alone Procedure Document, GWPD 1
United States Geological Survey, Office of Ground Water, Water-Level Measurement Using an Electric Tape, Stand-Alone Procedure Document, GWPD 4

FIGURE 1
WELLS CURRENTLY MEASURED BY LAKE COUNTY WATERSHED PROTECTION DISTRICT

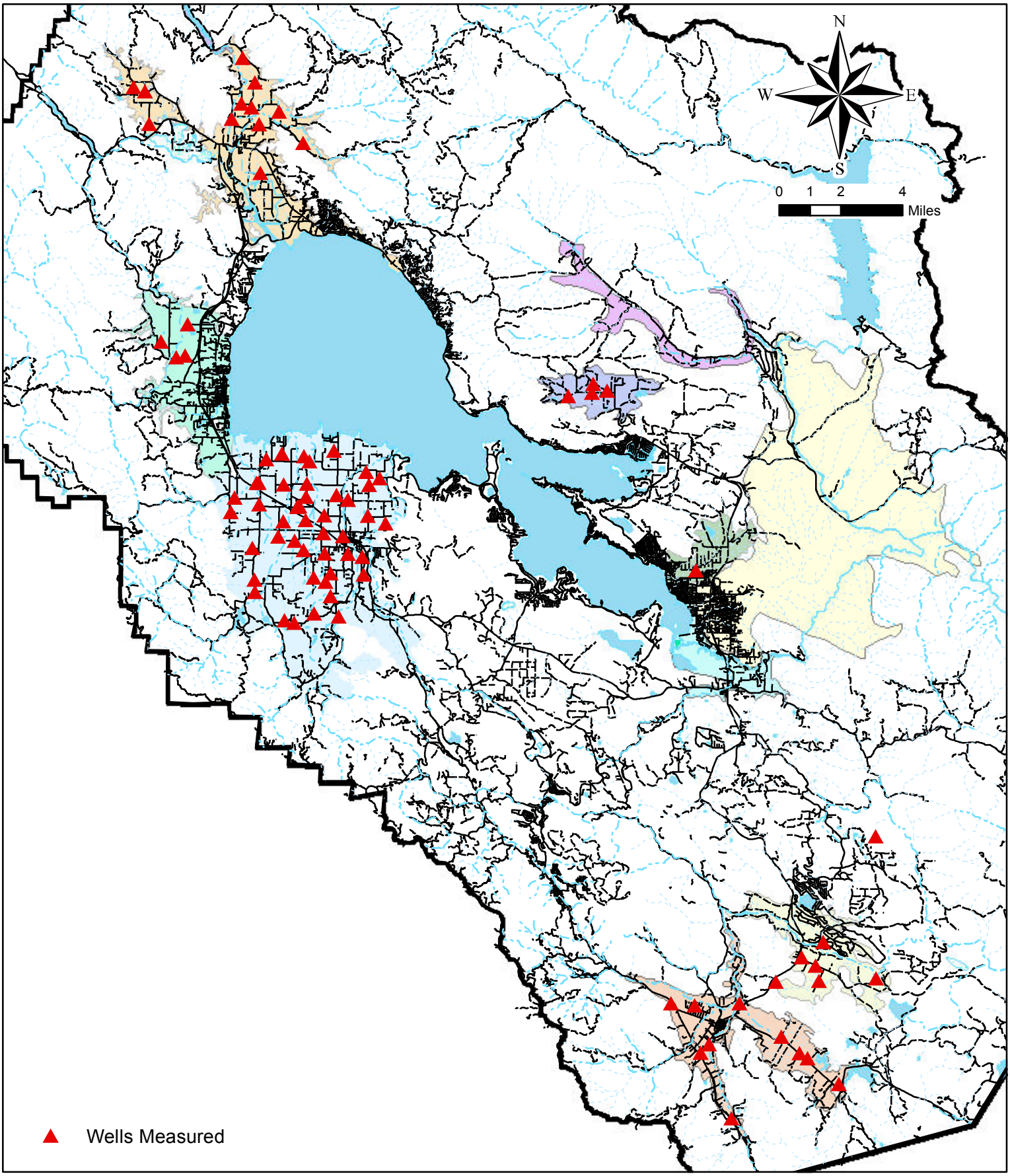

FIGURE 2
PROPOSED CASGEM WELLS
UPPER LAKE VALLEY

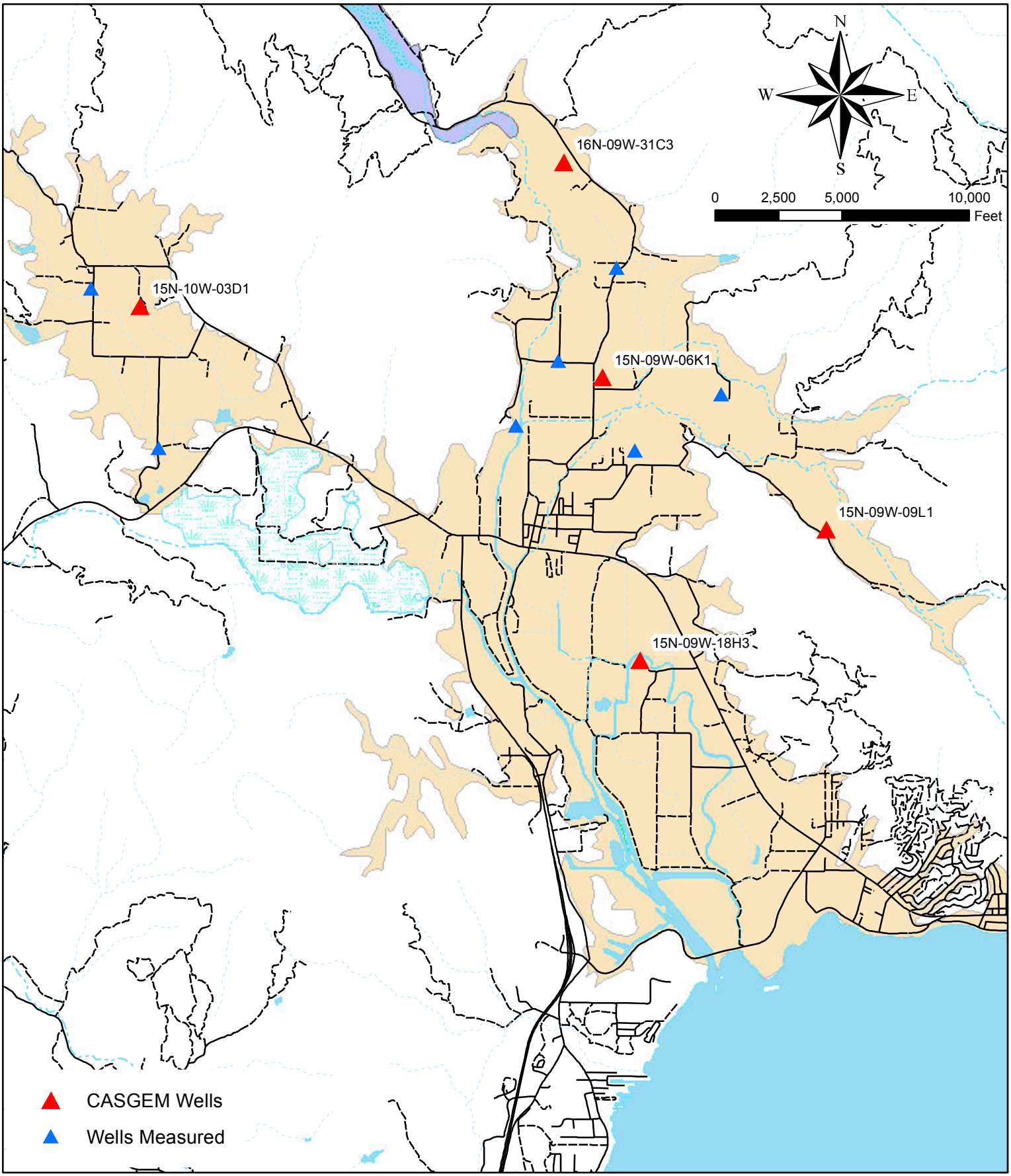

FIGURE 3
PROPOSED CASGEM WELLS
SCOTTS VALLEY

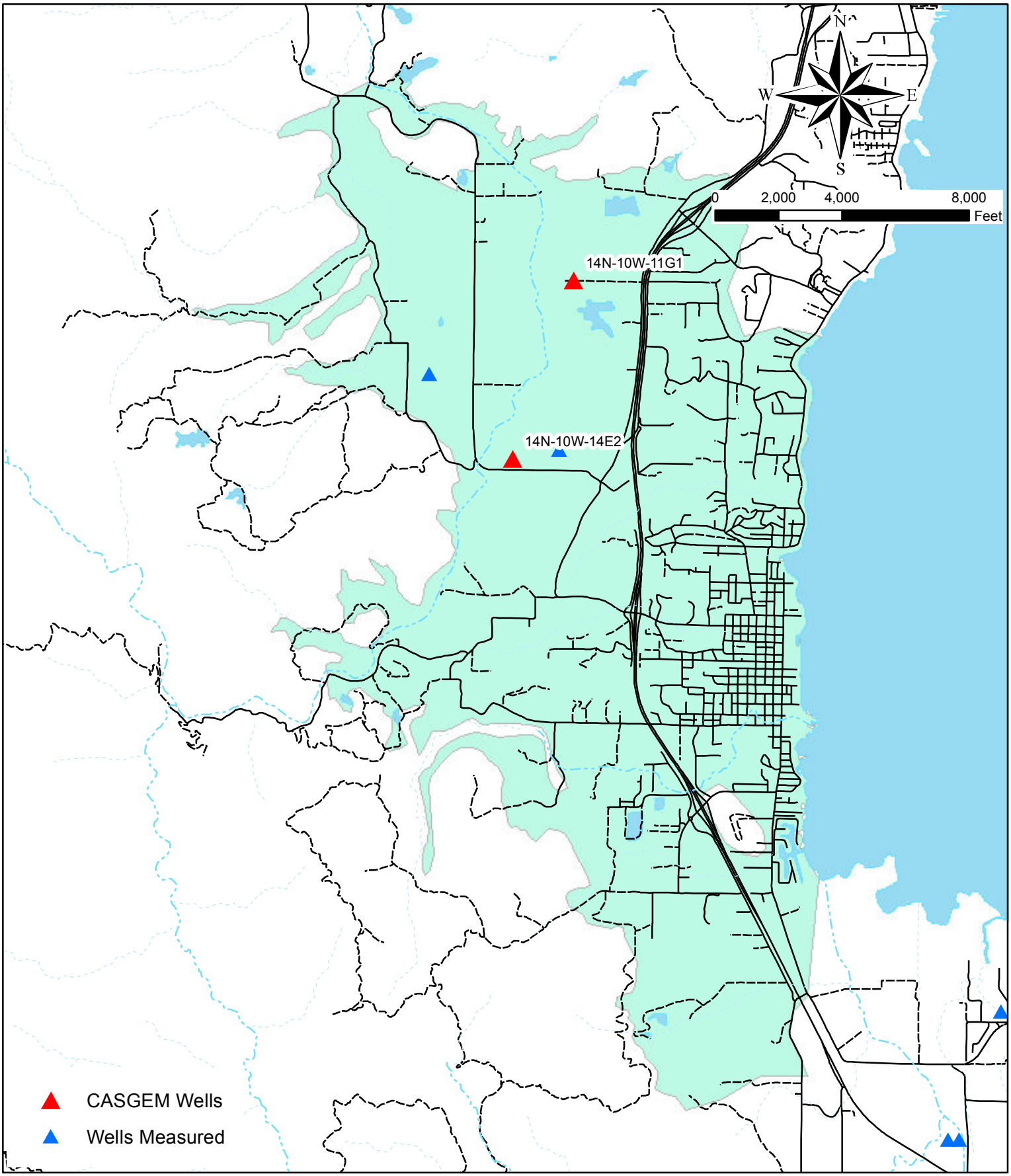

FIGURE 4
PROPOSED CASGEM WELLS
BIG VALLEY

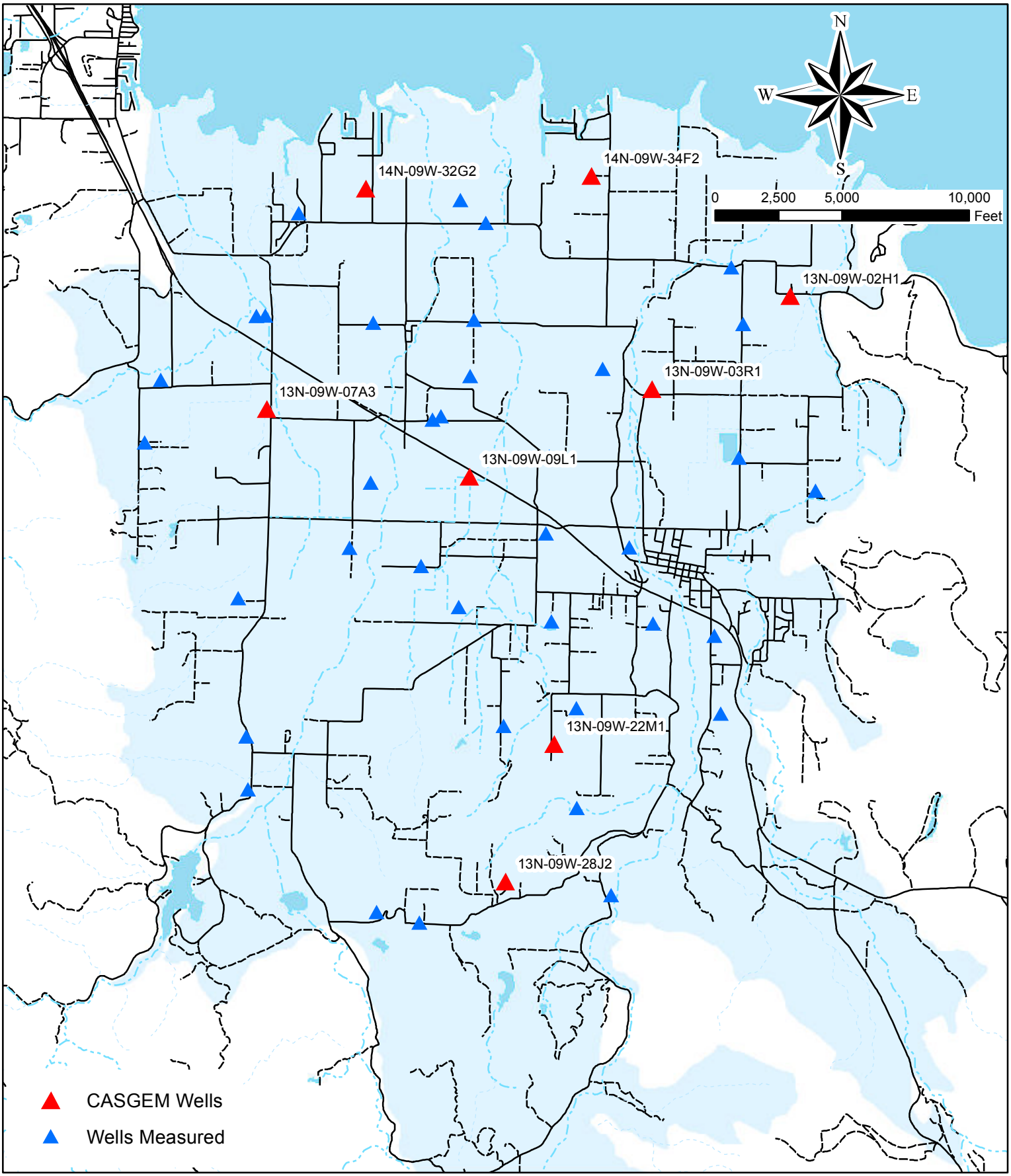

FIGURE 5
PROPOSED CASGEM WELLS
HIGH VALLEY

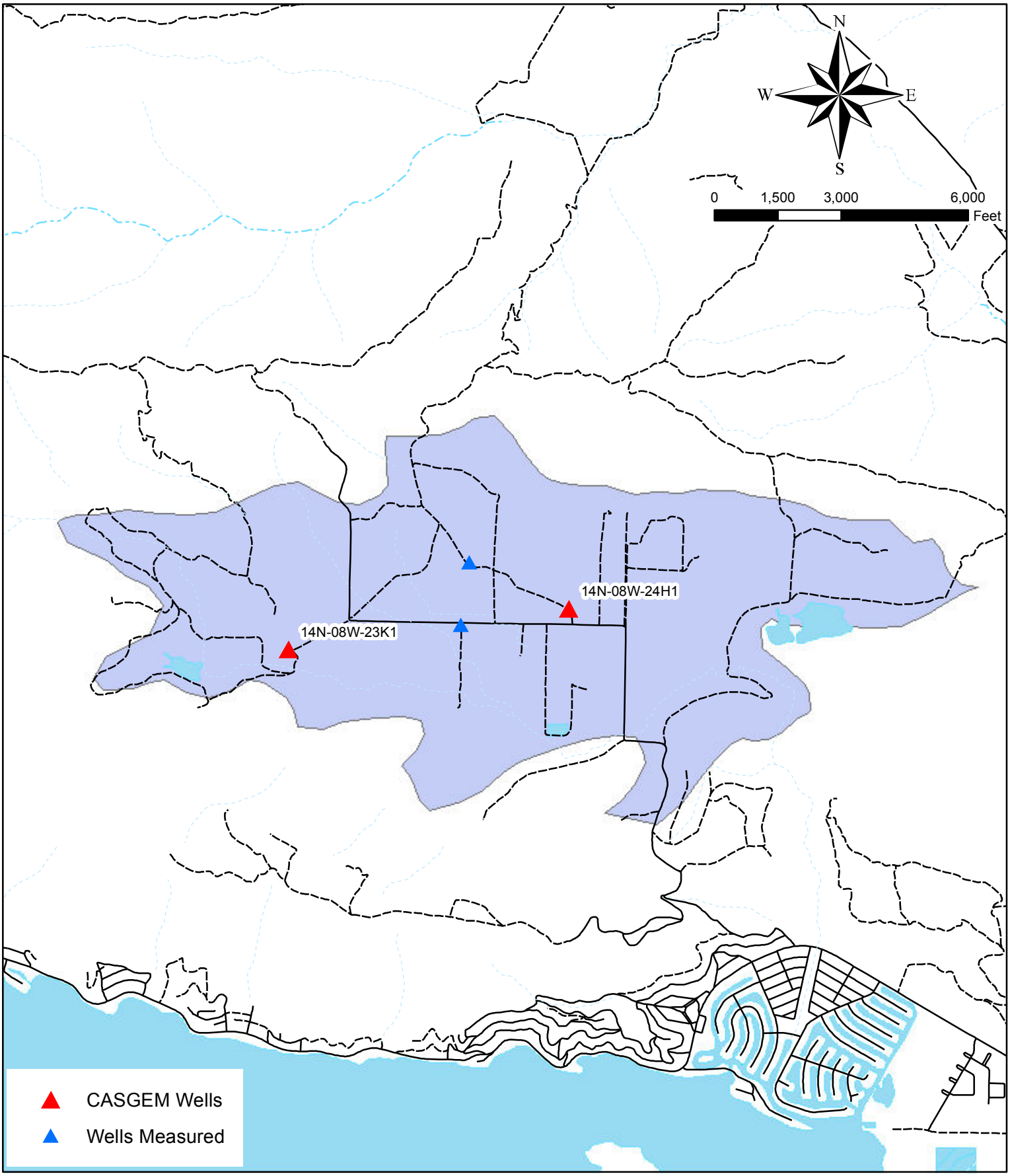

FIGURE 6
PROPOSED CASGEM WELLS
BURNS VALLEY

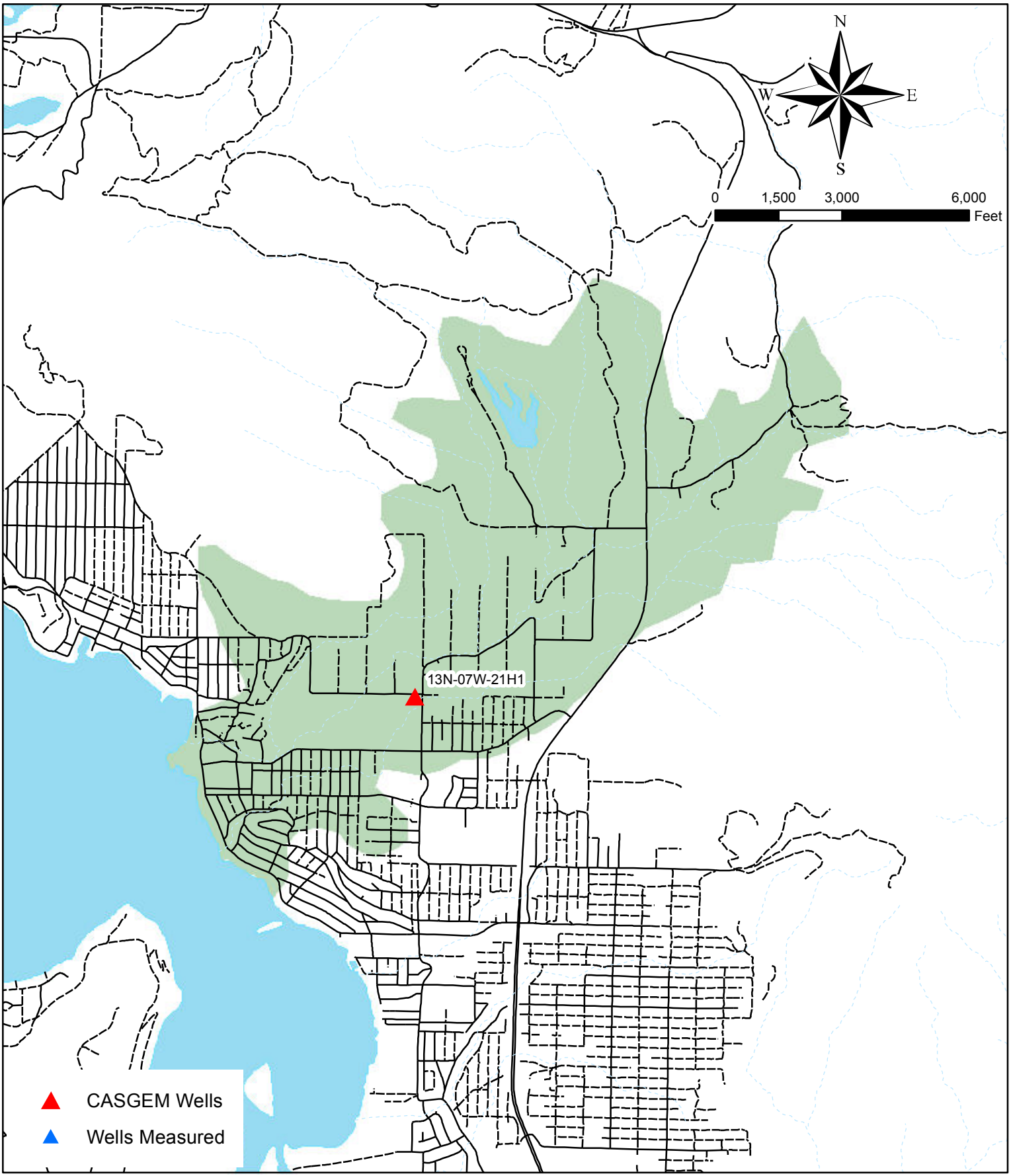

FIGURE 7
PROPOSED CASGEM WELLS
COYOTE VALLEY

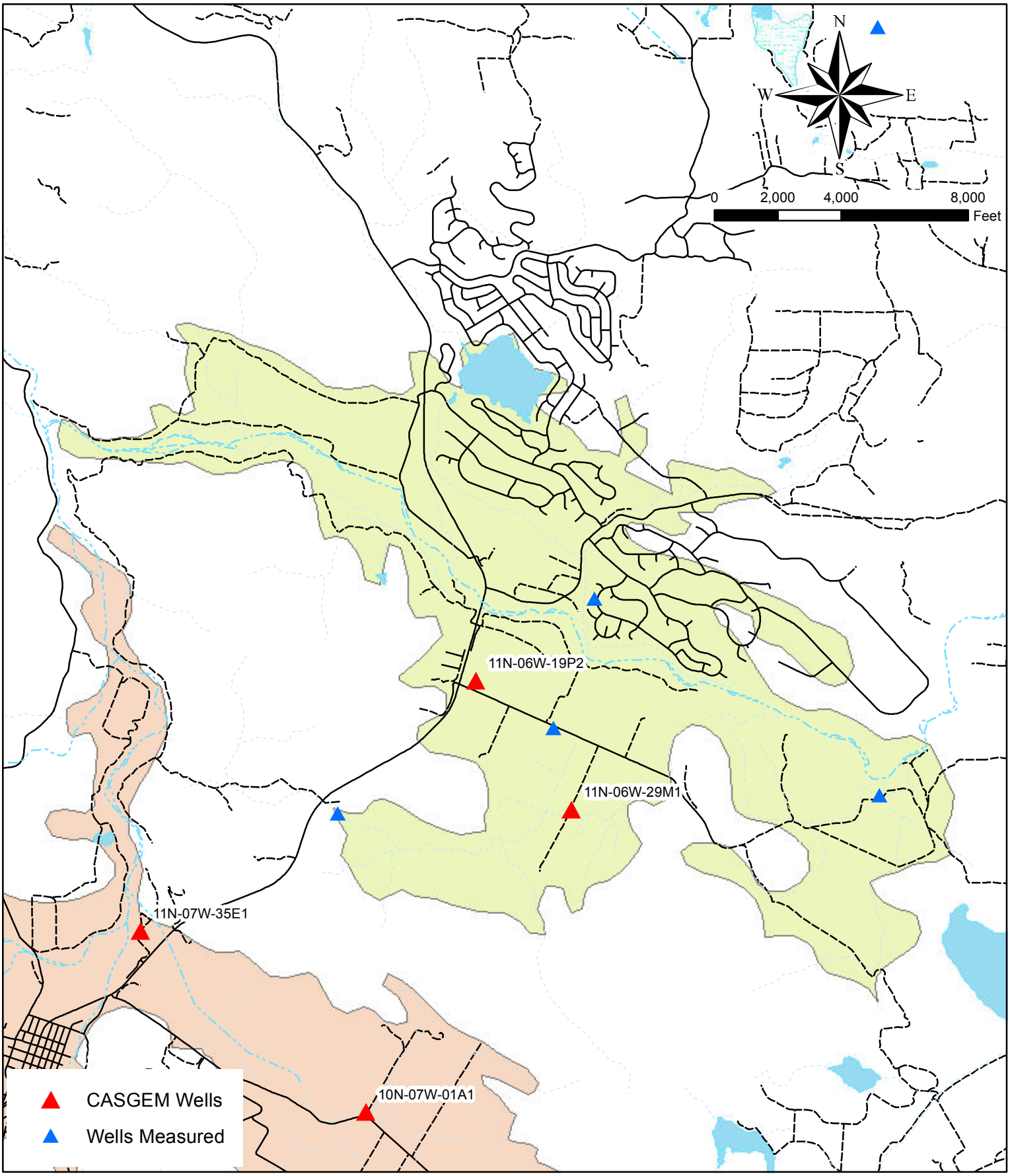
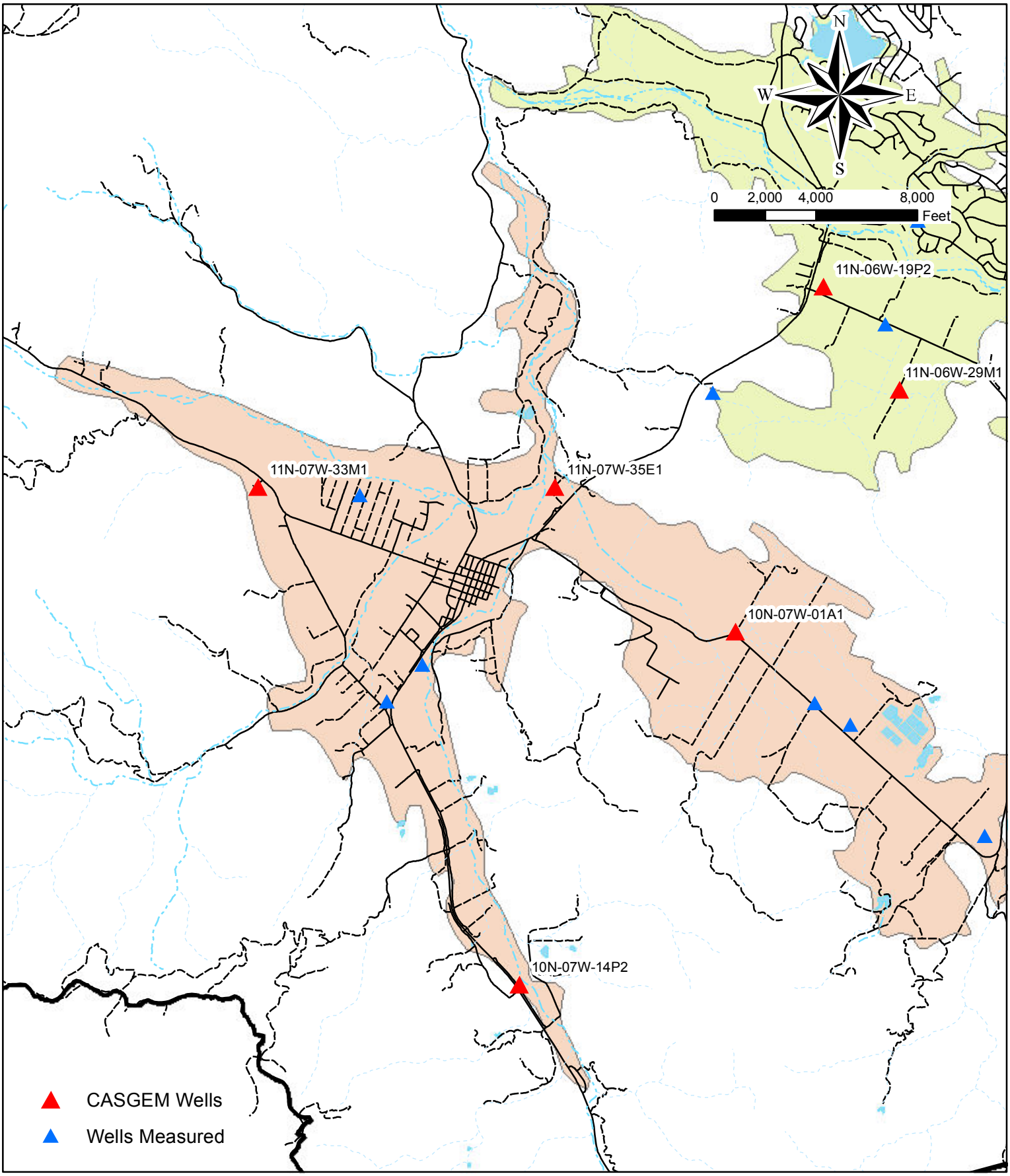
FIGURE 8
PROPOSED CASGEM WELLS
COLLAYOMI VALLEY