- Upstream and downstream reach elevation
- Manning's channel roughness coefficient

The streamflow parameters were applied to all the reaches discussed in Section 2.4.3.

River recharge into the Basin was calculated by SFR package of MODFLOW, and depended mostly on the K_b values. These values ranged from 0-20 feet per day, as shown in Table 13. A value of zero represents a concrete lined channel where no streamflows recharge into the Basin. The highest value of 20 ft/d occurs upstream along Bautista Creek where a flood retention pond area exists. The flood plains were simulated using the high K_b values. Indian Creek and Poppet Creek are tributaries to the San Jacinto River and have high infiltration rates as they combine with the San Jacinto River. The high infiltration rates were based on the assumption that flow from these two tributaries recharge in Canyon and do not reach Upper Pressure.

Historically, most or all streamflow occurs in Upper Pressure and Canyon, except during wet years. As a result, higher K_b values were input for the reaches in Canyon and Upper Pressure up until Bridge Street.

It should be noted that Salt Creek was included in the model, but had no streamflows associated with the reach. In general, little to no flow exists in Salt Creek, but the reach can act as a drain when water levels increase above the streambed invert elevations. It was input into the model for future use when more data becomes available. Modeled rivers are shown in Figure 64.

Table 13: Streambed Hydraulic Conductivities

River Reach	Streambed Hydraulic Conductivity (K_b)
Indian Creek	10 ft/d
Poppet Creek	10 ft/d
Bautista Creek	0-20 ft/d
San Jacinto River	0.005-5 ft/d
Soboba Pit	5 ft/d
Perris Drain	0 -1 ft/d
Salt Creek	0 ft/d

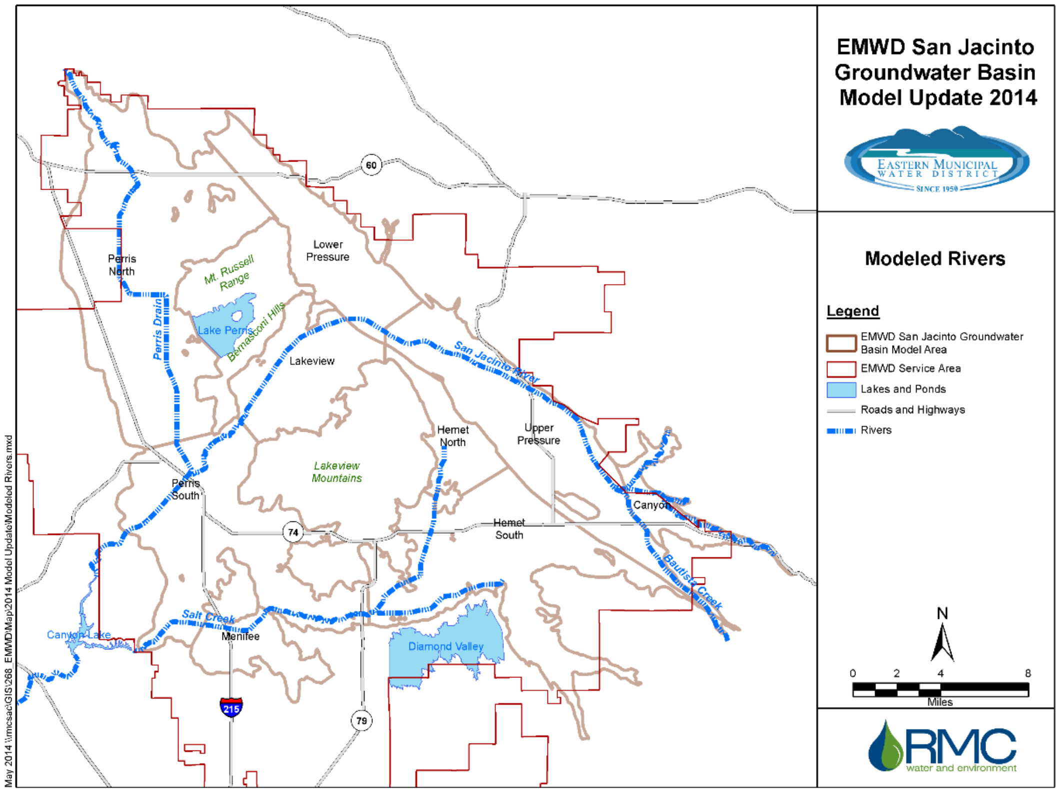

Figure 64: Modeled Rivers

3.10 Boundary Conditions

3.10.1 *Mountain Front Recharge*

While the Basin is a closed groundwater basin with no significant natural subsurface outflows, it does receive additional inflows through local runoff from adjacent watersheds, referred to as mountain front recharge. This local runoff is not gauged, but is an important component of the overall water budget for the Basin. Preliminary estimates of mountain front recharge rates were based on the calibrated rates of the SJFTM-2002. Mountain front recharge was simulated as specified-fluxes at the boundaries of the model. The estimated rates were refined during calibration of the SJFM-2014.

Mountain front recharge was applied to the SJFM-2014 as transient data. The quantity and location of annual applied fluxes are presented in Figure 65. Some mountain front recharge fluxes were applied to specific layers and others are applied to multiple layers. The fluxes are color coded by the layer or layers they are applied to.

Since flows from the mountain front recharge correlate to rainfall events, the transient data was calculated by multiplying mountain front recharge by a rainfall factor for the gauge closest to the flux location. The rainfall factor was calculated based on rainfall during a stress period relative to the long term average rainfall at the gauge. The rainfall factor was not applied to fluxes that were applied to all layers (yellow colored fluxes in Figure 65) such as those in Lower Pressure, Canyon, and Hemet South. This is because these fluxes are believed to be constant water sources in the area.

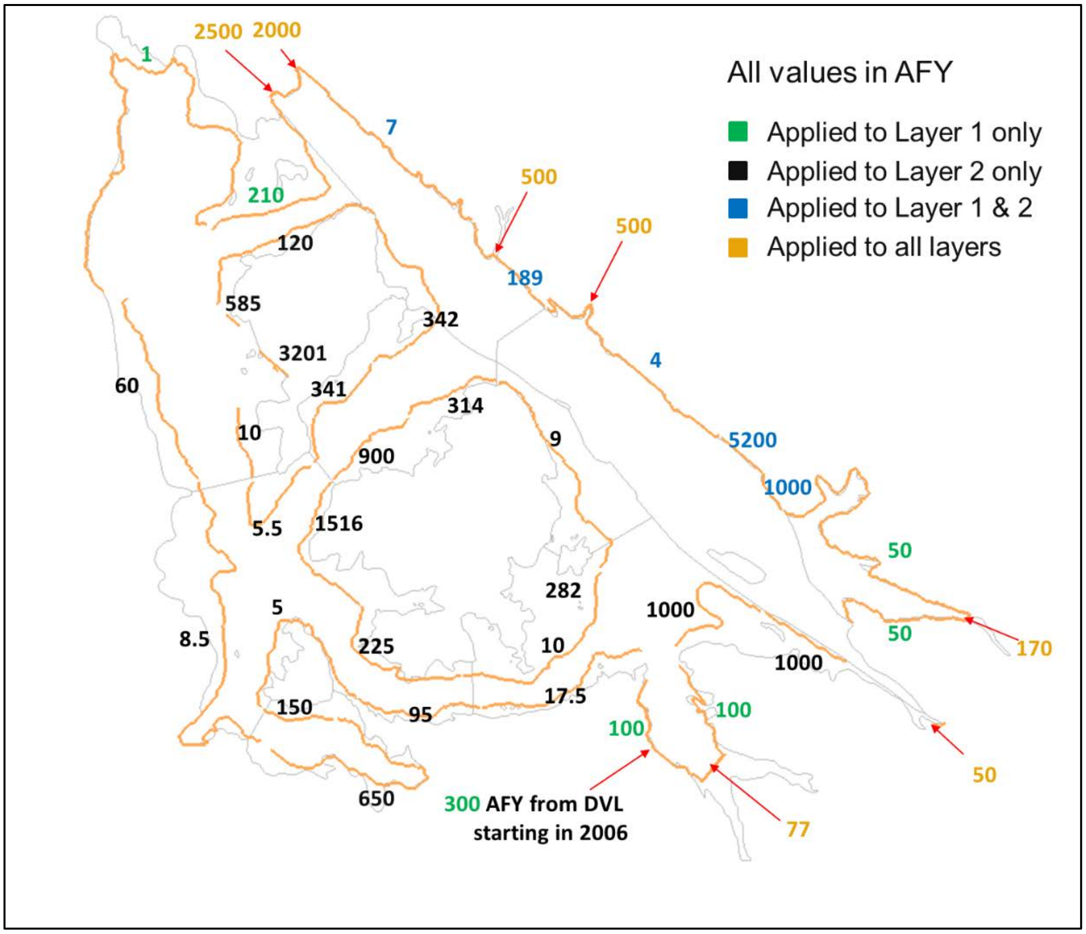

Figure 65: Average Annual Mountain Front Recharge Applied to the SJFM-2014 in AFY

3.10.2 *Contribution from Surface Water Reservoirs*

Lake Perris and Diamond Valley Lake (DVL) are both water bodies located outside the Basin GMZs. Underflows from Lake Perris and DVL enter the Perris North GMZ and the Hemet South GMZ, respectively, impacting water levels in those areas and the water budget within the Basin. The underflow underneath the dam from Lake Perris into Perris North was estimated to be 3,786 AFY, where 585 AFY was due to underflow under the west abutment and 3,201 AFY was due to underflow of the subterranean stream beneath the east abutment. The underflow from DVL was estimated at 300 AFY, according to EMWD (Figure 65). Underflow from Lake Perris and DVL were also modeled as constant flux boundaries.

3.11 Initial Conditions

The SJFM-2014 used 1984 as initial conditions for the model. Groundwater level data in 1984 was sparse, especially in the western part of the model area, as seen in Figure 66. As a result, initial conditions were estimated through a steady state model run and refined throughout the calibration process to provide a better match with the observed data. Figure 67 shows the initial groundwater elevations used in SJFM-2014.

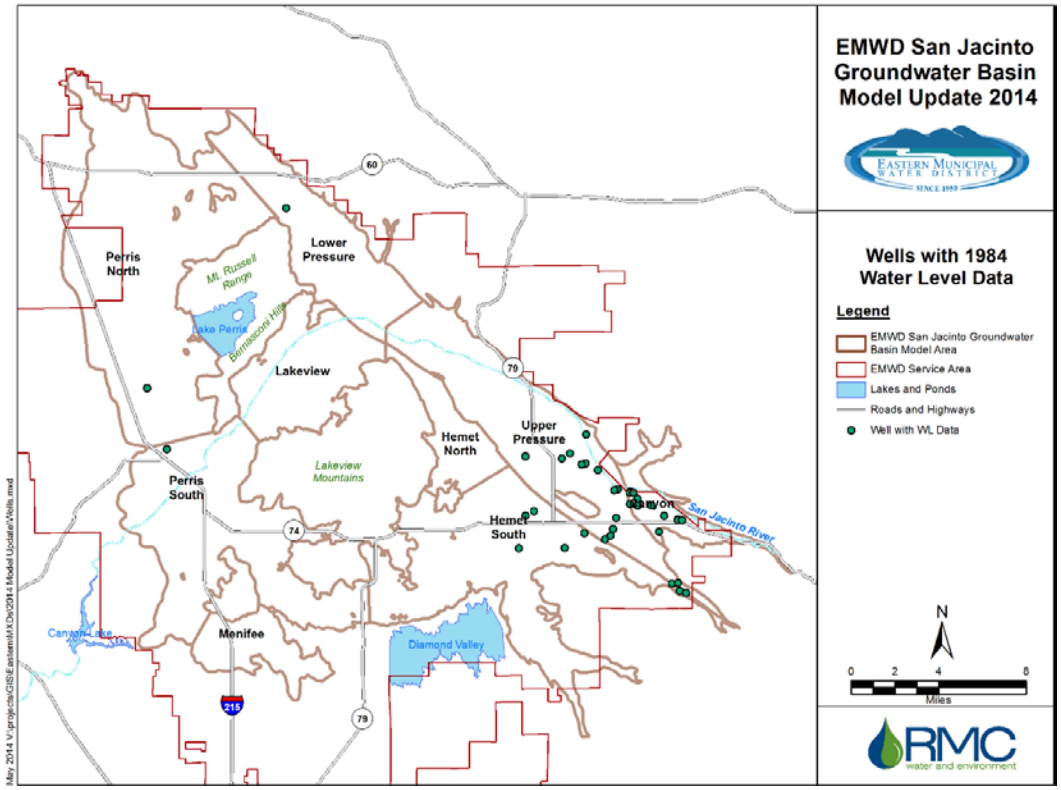

Figure 66: Wells with Water Level Data in 1984

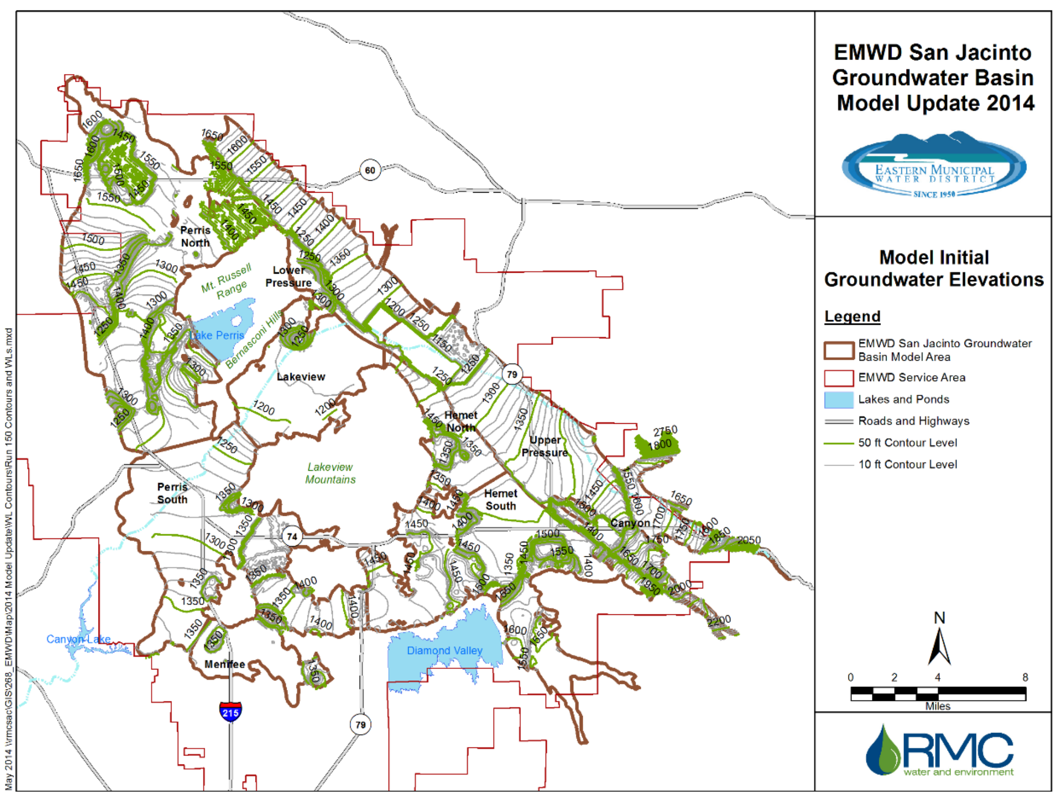

Figure 67: Model Initial Groundwater Elevations

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Section 4 Model Calibration

4.1 Conceptual Model Updates

The conceptual model of the San Jacinto Groundwater Basin was developed prior to numerical model development based on the best available data. The conceptual model was then refined throughout the calibration process by identifying areas where the data supported adjustments to the conceptualization. The following refinements were made to the conceptual model during calibration.

- Two trans-sectional faults were added to Canyon GMZ (section 3.3)
- One longitudinal fault was added to the Upper/Lower Pressure GMZs boundary (section 3.3)
- Wider ranges of horizontal and vertical hydraulic conductivities were applied in the Hemet-San Jacinto Groundwater Management Area (section 4.5.1)
- Layer 4 was added to Lower Pressure and Upper Pressure GMZs (section 3.2)

The conceptual model presented in Section 2 includes details of all of the above improvements made to the model during calibration.

4.2 Calibration Wells

An inventory of 601 wells with water level data was used for selection of target wells to be used for calibration of the SJFM-2014. The selected target calibration wells provided reliable historical data that served as fair representation of long-term water levels within the Basin. Comparison of simulated heads to observed water levels provided metrics for evaluating the status and quality of model calibration. Based on the availability of data, the selected well set provided good geographic coverage of the Basin as well as good representation of each of the four model layers to the best possible extent. Selection criteria, as provided below, were established for selecting a subset of the 601 wells for use as calibration targets.

- Removed Wells – A well was not selected as a target calibration well if:
  - Well had no observation data within the study period (1984-2012)
  - Well was located outside of the active model cell grid
  - Well had similar water levels to another well located within a few model cells
- Selected Wells – A well was selected as a target calibration well if:
  - Well was identified as a key well (by EMWD, Watermaster, or Advisory Panel members)
  - Well was a California Statewide Groundwater Elevation Monitoring (CASGEM) Program compliant well
  - Well had screening data

Target calibration wells were initially selected based on the criteria presented above. It should be noted that the removal criteria superseded the inclusion criteria. For example, if a well was classified as CASGEM compliant, but had no observation data within the study period, the well was removed from the target calibration well set since it did not contribute to the calibration process. After completing the initial selection criteria, wells were reviewed again to remove those with small datasets (fewer than five data points) and those that did not appear to fit the long-term trends of the Basin or surrounding wells. Lastly, the selected well set was reviewed by EMWD and Advisory Panel members to add any additional key wells and ensure good spatial coverage of the Basin.

It should be noted that there were several instances where multiple wells occupy one cell. This was common for USGS wells with multiple screens at different depths. Some of these multiple-screened wells showed a difference in water levels, indicating a vertical gradient difference across the screened intervals. The regional SJFM-2014 model does not have sufficient resolution to capture these differences in water levels across small screen-elevation differences. Accurate simulation of these details would require a localized model with finer resolution.

There were 197 wells selected as calibration targets from the EMWD well database. Locations of the calibration wells are presented in Figure 68. In general, the wells were well distributed, but the bulk of the calibration wells were located in Upper Pressure, Hemet South and Perris South. Table 14 provides the breakdown of wells by GMZ.

Table 15 presents the location of calibration wells by layer based on available screening information. Complete information on the calibration wells, including screen elevation and model layer assignment, is provided in Appendix A. Layer information for wells without screening data was assigned layers based on location and observed heads of nearby wells.

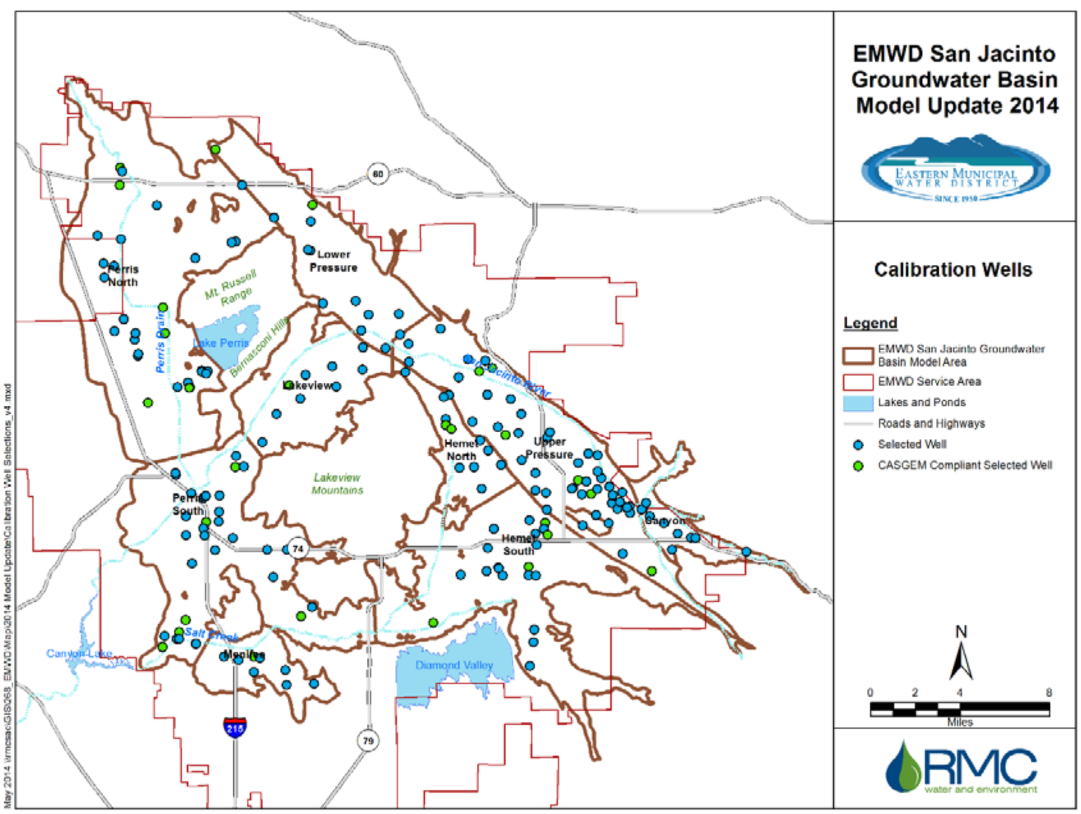

Figure 68: Locations of Selected Target Calibration Wells

Table 14: Distribution of Calibration Wells by GMZ

GMZ	Available Wells	Selected Wells	
		CASGEM Compliant Wells	Other Wells
Perris North	76	7	24
Perris South	81	10	25
Menifee	31	1	7
San Jacinto Lower Pressure	27	2	11
Lakeview	43	1	8
Hemet North	41	4	10
Hemet South	106	10	16
San Jacinto Upper Pressure	162	8	43
San Jacinto Canyon	34	1	9
Total	**601**	**44**	**153**

Table 15: Distribution of Target Calibration Wells by Layer

Layer	Number of Wells
Layer 1 Only	58
Layer 1 & 2	58
Layer 1, 2 ,3	13
Layer 1, 2, 3 & 4	3
Layer 2 Only	8
Layer 2 & 3	19
Layer 2, 3 & 4	2
Layer 3 Only	2
Layer 3 & 4	0
Layer 4 Only	0
Wells with Unknown Layering	34
Total	**197**

4.3 Measurement of Calibration Status

The SJFM-2014 calibration status was measured using two metrics: simulated and observed groundwater level matching statistics and groundwater level trend matching. The statistics were evaluated to meet a reasonable statistical range meeting American Standard Testing Methods (ASTM D5981, 2008). In addition to quantifiable metrics, the SJFM-2014 calibration was evaluated by generating reasonable regional groundwater flow directions and producing realistic water budgets.

The MODFLOW volumetric discrepancy goal was set to be less than 0.2%.

4.3.1 *Simulated and Observed Head Difference Statistics*

The "Standard Guide for Calibrating a Groundwater Flow Model Application" (ASTM D5981-96) states that "the acceptable residual should be a small fraction of the head difference between the highest and lowest heads across the site." The residual is defined as the simulated head minus the observed heads. An intra-well analysis of all calibration wells indicated the presence of 300+ feet of water level changes. Using 10 percent as the "small fraction", the acceptable residual level would be 30 feet. The acceptable residual level was refined and groundwater level residuals were considered at a GMZ level as well as basin-wide. Calibration goals for the groundwater level residuals were set less than the 10 percent head difference level to the following.

- 50% of residuals within +/- 20 feet
- 75% of residuals within +/- 30 feet

For further analysis, statistics are presented on a GMZ and basin-wide level by means of scatterplots comparing:

- Simulated heads versus observed heads
- Residual versus simulated heads
- Residual versus time

4.3.2 *Groundwater Level Trend Matching*

Matching groundwater level trend is a qualitative and important measurement of performance of the SJFM-2014. This qualitative analysis compared the long-term and short-term seasonal trends of simulated and observed water levels. Both regional trends and local trends were compared. Regional analysis focuses on trends of clusters of wells while local analysis focuses on individual wells. Since the trend matching is qualitative, the goal of groundwater level trend matching is to ensure that simulated heads generally followed the same trends as the observed data and adequately captured response to stresses.

Groundwater trend matching provide strong support to quantitative statistics. For example, statistics may be misleading in instances where simulated heads start below observed values but end up higher due to the steeper slope of the simulated values. Statistics may show that simulated values were within +/- 20 feet throughout a majority of the hydrograph but analysis of groundwater levels in the hydrograph may reveal that the trend of the simulated values does not match that of the observed heads. When groundwater level trends match observed data, statistics will inherently be good, providing high confidence in model calibration.

As a regional model, the SJFM-2014 was expected to match the majority of hydrographs in a Basin. All hydrographs were reviewed for trend matching, calibration of groundwater trends focused on areas with sufficient data, important production areas, areas for future development, and key GMZs in the Basin as identified by EMWD. These included the brackish groundwater wells in Perris South, the core production area in Hemet South, the intake area of Upper Pressure and the Canyon GMZ. Figure 69 shows an example of a good groundwater level trend match in Upper Pressure GMZ.

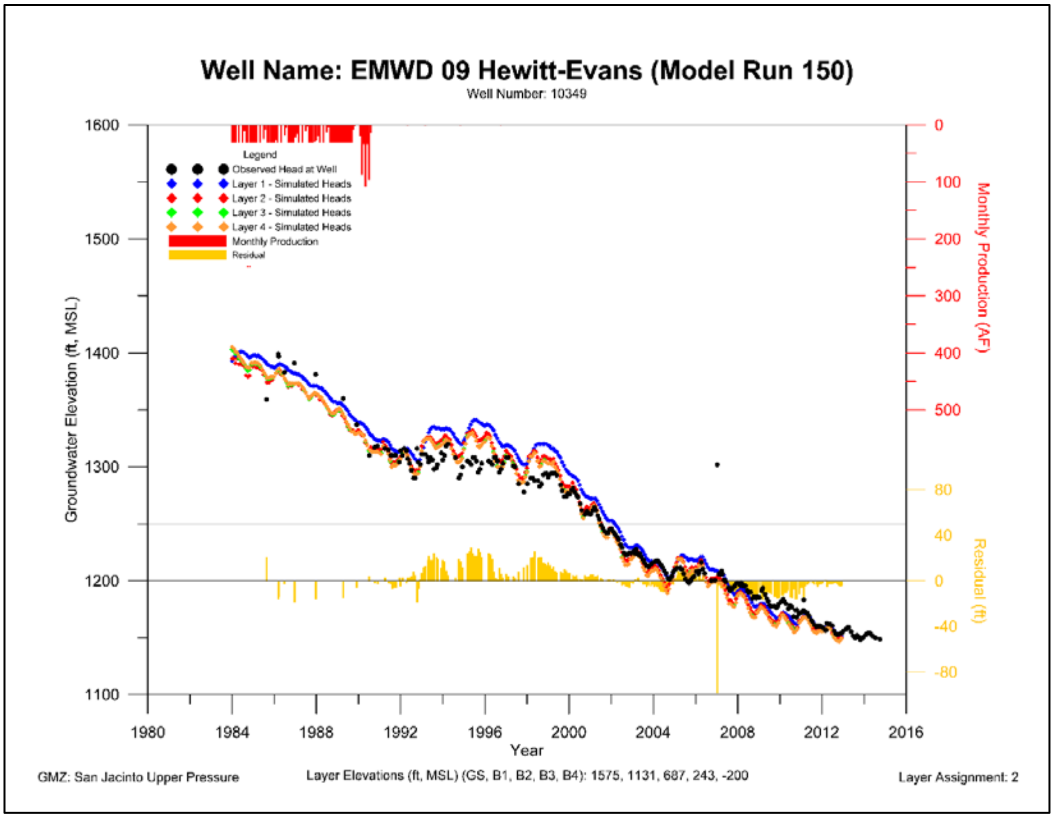

Figure 69: Example of Groundwater Level Match in Upper Pressure GMZ

4.4 Calibration Steps

The calibration process began after developing the model input data and processing the observed water level data. The purpose of calibration was to attain a reasonable match between the observed (i.e., historical) and simulated data and meeting the set of calibration goals and targets. This includes both qualitative and quantitative comparisons and analysis. Calibration was achieved through several iterations of aquifer parameter adjustments and review of model results. Throughout the iterative process, data inconsistencies were discovered and resolved. Additionally, improvements to the conceptual model were implemented to achieve a better calibration.

The process used to calibrate the SJFM-2014 included:

- Water budget calibration
- Steady state calibration
- Parameter estimation
- Groundwater level calibration

4.4.1 *Water Budget Calibration*

It was imperative to establish a realistic water budget for each GMZ and for the overall Basin. This information was vital for establishing a safe yield estimate for each GMZ, evaluation of future projects and assessment of the Basin. The water budget components for each GMZ include:

- Inflows
  - Deep percolation from applied water components and rainfall
  - Recharge from recharge ponds
  - Incidental recharge from reclaimed water facilities
  - Recharge from streamflow seepage
  - Mountain front recharge
  - Subsurface inflows from adjacent GMZs
- Outflows
  - Groundwater production
  - Subsurface outflows to adjacent GMZs

Initial adjustments were made to the soil drainage factors to modify, increase or decrease as required by observational data, the applied water recharge in the Basin and optimize recharge quantities. Once applied water recharge values were in a representative range, river recharge budgets were reviewed for consistency with those defined in the Canyon Operating Plan and found both methods yielded similar results. This included adjusting streambed hydraulic conductivity of the San Jacinto River, Indian Creek, Poppet Creek and Bautista Creek. No adjustments were made to the groundwater production.

4.4.2 *Steady State Calibration*

The objective of the steady state calibration was to improve the understanding of and quantify model parameters for transient calibration, specifically the following:

- Hydraulic Conductivity
- Applied water recharge
- Mountain front recharge

In general, steady state conditions are not present in any given year of the SJFM-2014 study period. Review of Basin conditions from 1984 to 2012 indicated that 2009 was the closest year to a steady state condition with adequate data for model calibration therefore, after discussion with the Advisory Panel, 2009 was selected for Steady State calibration. Table 16 provides a general description of groundwater conditions in the Basin in 2009. Averaged 2009 data was used for applied water components, groundwater production, mountain front recharge and streamflow for steady state calibration.

Table 16: San Jacinto Groundwater Conditions in 2009 for Steady State Calibration

Item	Condition
Groundwater Elevation Trends	• Generally steady state trends with exceptions in the Upper Pressure Intake area and Canyon
Hydrology	• End of a lower than average rainfall period • Represents slightly below average rainfall
Recycled Water and Agricultural Water Use	• Recently introduced enhanced recycled water use and agriculture water use tracking
Dataset	• More complete dataset to allow in-depth assessment of steady state parameters • Better areal extent of data for developing starting heads

During calibration of the steady state model, modifications to aerial recharge, boundary fluxes, hydraulic conductivities, and reclaimed water recharge were implemented at a GMZ level, with the most significant changes occurring in Upper Pressure and Canyon. Parameter modifications were performed until a reasonable fit between observed and simulated heads was achieved.

As an additional calibration guideline, the mean absolute error and mean residual standard deviation for each GMZ were compared to the change in head for the GMZs. The goal was for these calibration statistics to approach 5-10% of the change in head for each GMZ. Only wells discretely screened in a given layer were used for steady state calibration.

Over 30 steady state runs were completed while making several parameter changes. Typically, one parameter was evaluated at a time to best understand the effects of the parameter change in the model. Throughout the calibration process, the recharge rates and boundary fluxes tested ranged from 50 to 150 percent of their original value. This helped control the differences in water levels noted during the calibration runs.

Horizontal hydraulic conductivities (K_h) were modified, ranging from 0.5 ft/d to 12 ft/d basinwide. Vertical hydraulic conductivities (K_v) were typically changed based on a factor of K_h, ranging from $0.005K_h$ to $0.1K_h$. Modifications to the hydraulic conductivities were made and evaluated in all model layers.

The steady state model helped refine parameter modifications necessary throughout the Basin, especially hydraulic conductivities in Upper Pressure and Canyon. Additionally, the evaluation of reclaimed pond incidental recharge rates helped to improve water level issues in specific reclaimed pond areas. The steady state model provided a better understanding of parameter sensitivity, which allowed for an improved and more efficient transient calibration process.

The calibrated steady state model parameters were applied to the transient model for further calibration. Model parameters were adjusted during transient calibration to minimize the difference between simulated and observed heads.

4.4.3 *Parameter Evaluation*

A set of model parameters was selected for evaluation of their effects on the simulated groundwater system and its impact on achieving the calibration goals. Parameters evaluated at the GMZ level included the following:

- Horizontal hydraulic conductivity
- Vertical hydraulic conductivity
- Specific yield
- Specific storage
- Mountain front recharge
- Streambed conductivity
- Percolation factors
- Fault leakance

For each parameter, the model was set up and run several times with each run having a different parameter value. Since the GMZs on west and east side of the Casa Loma Fault were essentially separated hydraulically by this fault, parameter changes for GMZs west and east of the fault were evaluated simultaneously to decrease the number of model runs needed for evaluation of parameters. This increased the efficiency of evaluation process of the parameters in each GMZ.

Parameters values were adjusted within a reasonable range of available data. In more complex areas such as Upper Pressure and Canyon, parameter values changes were more than those of other GMZs. Generally, the range of change for each parameter was between 50 and 150 percent of the original value. The effect of the change on simulated heads and calibration statistics was noted for each run. Table 17 provides the number of runs associated with evaluation of each parameter.

The evaluated parameters were modified within the determined reasonable range of values in the transient calibration to meet the calibration goals. More detailed discussion of transient calibration is presented in Section 4.5.

Table 17: Simulation Runs for Evaluation of Each Parameter

Parameter	Simulation Runs
Horizontal hydraulic conductivity	62
Vertical hydraulic conductivity	50
Specific Yield	32
Specific Storage	27
Mountain Front Recharge	14
Streambed Conductivity	10
Percolation Factors	24
Fault Leakance	11

4.4.4 *Groundwater Level Calibration and Hydrograph Trend Matching*

In order to aid in calibration and reduce modeling calibration runs, hydrographs of each calibration well were developed with a post-processor tool developed cooperatively by EMWD and RMC. The tool plots simulated heads for all active layers, observed heads, groundwater production data, and calculated head residuals. The plots provide a comprehensive analysis for each calibration well. An example hydrograph is provided in Figure 70.

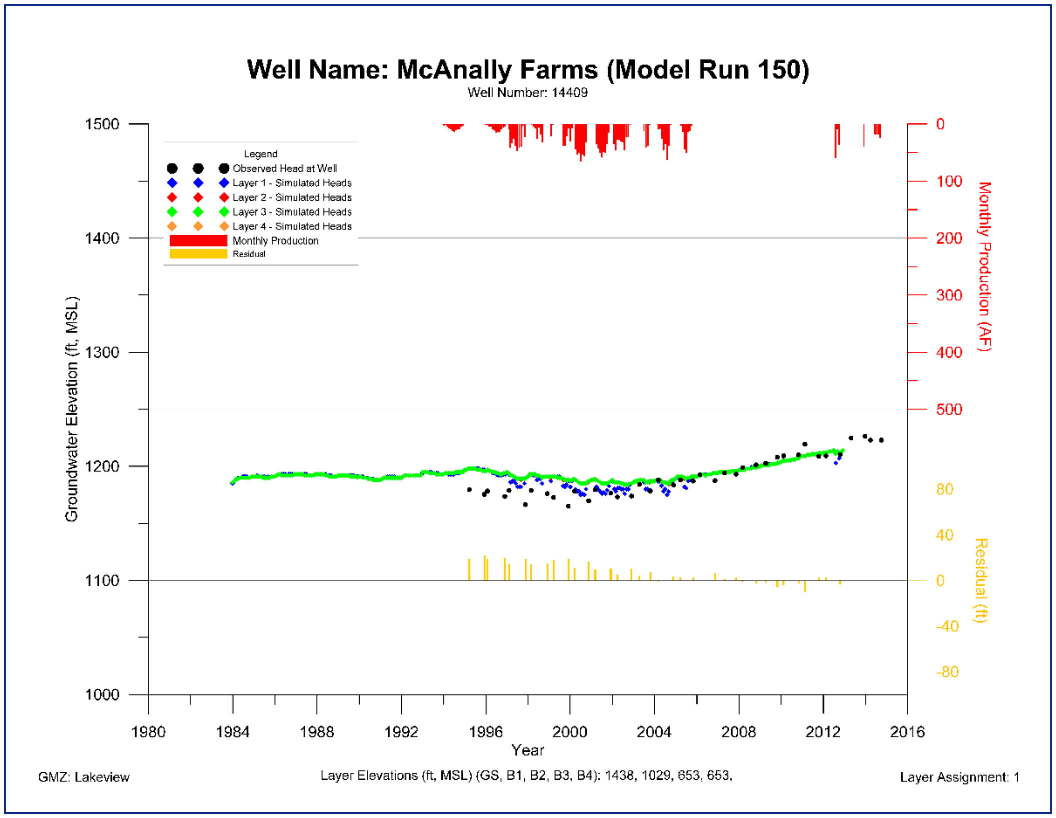

Figure 70: Example hydrograph developed by EMWD/RMC post-processor tool

Evaluation of the model calibration statistics and hydrograph trend matching was performed after each model run. The goal of the trend analysis was to match seasonal fluctuations and long-term trends. Hydrographs were compared with hydrographs from prior calibration runs to assess the effects of parameter changes, which helped refine the parameter values and improve understanding of the model. Groundwater level calibration and hydrograph trend matching complements the statistical analysis of the model for a stronger calibration metric. It is important to note that while a useful tool for aiding in calibration result understanding, the hydrographs were just a tool. Additionally, the hydrograph tools do not account for offset from the cell node which implies a higher level of accuracy in the hydrographs than what actually exists. The final model calibration metrics are based on standard statistical methods.

4.5 Calibration Results

After an iterative approach of refining and modifying model inputs and aquifer parameters, the calibration goals were achieved. The model components that were modified include:

- Aquifer parameters (horizontal/vertical hydraulic conductivity, storage parameters)
- Water budget components (inflow and outflow components)
  - Aerial recharge rates and percolation factors
  - Mountain front recharge
  - Streambed conductivity
  - Fault leakance

- Model constructs in Hemet-San Jacinto GMZs

This section also discusses calibration statistics as well as groundwater level calibration and hydrograph trend matching.

4.5.1 *Aquifer Parameters*

Aquifer parameters were adjusted during the calibration process to improve the simulation of the groundwater flow system in the Basin and achieve the calibration goals. These aquifer parameters included:

- Horizontal hydraulic conductivity
- Vertical hydraulic conductivity
- Storage parameters

The calibration process was reviewed by EMWD and the AP and aquifer parameters were adjusted with their input. Details of the calibrated model parameters are presented in the following subsections.

4.5.1.1 Horizontal Hydraulic Conductivity

The calibration of the K_h values went through an extensive iterative process with several discussions with EMWD and AP members. Modifications and refinements were made to the K_h distribution in each GMZ to best fit the known characteristics and groundwater behavior of the Basin. Simulated groundwater levels and hydrographs of observed and simulated water levels were reviewed after each run and adjusted for a subsequent run until an acceptable level of calibration was reached.

The final calibrated K_h distribution used in the model is presented in Figure 71 through Figure 74. It should be noted that in several GMZs, the range of calibrated K_h values were slightly higher than approximated in the Conceptual Model and noted in Section 2.3.3. Most of the higher values occurred in the bedrock valleys due to the presence of water-bearing sediments, or the intake area of Upper Pressure. The final calibrated K_h distribution is discussed below by two regions: West (west of Casa Loma Fault) and East (east of Casa Loma Fault) Regions.

West Region (West of Casa Loma Fault)

In general, the K_h distribution west of the Casa Loma Fault follows the bedrock contours. K_h values are higher in the deeper parts of the aquifer and the bedrock valleys. The values gradually decrease towards the shallow bedrock areas. The highest K_h values are present in Hemet North and Hemet South GMZs. The lowest K_h values are present in northern parts of Perris North GMZ in the MARB area where the aquifer thickness is very shallow. Menifee, Perris South and Lakeview GMZs have higher K_h values in deeper parts of the aquifer where most groundwater extraction wells are located. A high K_h area also exists west of Lake Perris, where the subterranean stream exists beneath the east abutment of the dam.

In the central portion of Hemet North, a tighter gradient of K_h was modeled in Layers 2 and 3. This reduction in K_h was introduced in the model as part of the calibration process to generate the head difference that exists in the observed water levels in wells north and south of the K_h gradient. For similar reasons, a tighter K_h value was introduced in Layer 1 of Perris North transitioning from the MARB area east to the central portion of the GMZ.

The K_h distribution west of the Casa Loma Fault is the same throughout all three active layers except in Hemet North GMZ where a lower K construct exists in model layers 2 and 3.

East Region (East of Casa Loma Fault)

K_h values east of the Casa Loma Fault in Lower Pressure and specifically in Upper Pressure and Canyon, were different between Layers 1 through 3. Layer 4 has the same aquifer parameters as Layer 3.

The K_h values in Layer 1 of Upper Pressure took into account the presence of the clay cap, an area of clay soils that extends into the southern portion of Lower Pressure (refer to Section 2.3.3.2). The clay cap occurs on average in the top 100 feet of the aquifer. The thickness of the clay cap increases from south to north and was accounted for in the vertical conductivity parameters through a decrease in hydraulic conductivity where the clay cap thickness increases. Given that the average thickness of Layer 1 in the clay cap area is about 400 feet, a low value of K_h for the clay cap would not be fully representative of the entire layer, thus the calibrated K_h value for the composite of the materials in layer 1 was higher than a typical clay conductivity value.

Southeast of the clay cap area is the intake area of Upper Pressure, where a majority of the pumping in the Basin takes place. As a result, values of K_h in the Intake area are the highest in the entire SJFM-2014.

Values of K_h for Layers 2 through 4 in Upper Pressure were developed through discussions with EMWD and the Advisory Panel. A gradient of low K_h from the north to a higher K_h to the south was developed to mimic the flow pattern of the groundwater and represent the presence of coarser materials in the southern portion of Upper Pressure. Generally, the values of K_h decreased from Layer 2 down to Layer 4 while having a similar distribution. In Layer 2, values of higher K_h represented an alluvial fan from Massacre Canyon and Laborde Canyon, located at the northeast boundary of Upper Pressure and southeast boundary of Lower Pressure, respectively. This can be seen in Figure 72. A lower gradient of K_h was located just west of the alluvial fan to represent an area of historical groundwater depression seen in the contours published in water management area annual reports by EMWD.

In the Bautista Creek area, the southernmost part of Upper Pressure, the K_h parameters were higher in Layer 1 than Layers 2 to 4 to help keep water levels high to connect flows in Layer 1 from the higher elevations in the south to lower elevations following a steep drop in elevation moving northward.

The distribution of K_h in Canyon was based on the presence of three zones of observed groundwater levels and was refined after several iterations of aquifer parameter adjustments. Following the development of three main zones of K_h , hydraulic conductivities within each zone were refined to follow the soil type distribution within each zone. Soils in Canyon are predominantly type A and B. Areas with soil type A have higher K_h values, typically along the San Jacinto River. Three hydraulic zones in the Canyon GMZ were generated in the model by two separate modeled geologic structural divides: The northern zone (Zone 1), the middle zone (Zone 2) and the southern zone (Zone 3). In the Canyon GMZ, Zone 3 had the highest K_h values and Zone 2 had the lowest. The values decreased moving from Layer 1 down to Layer 3.

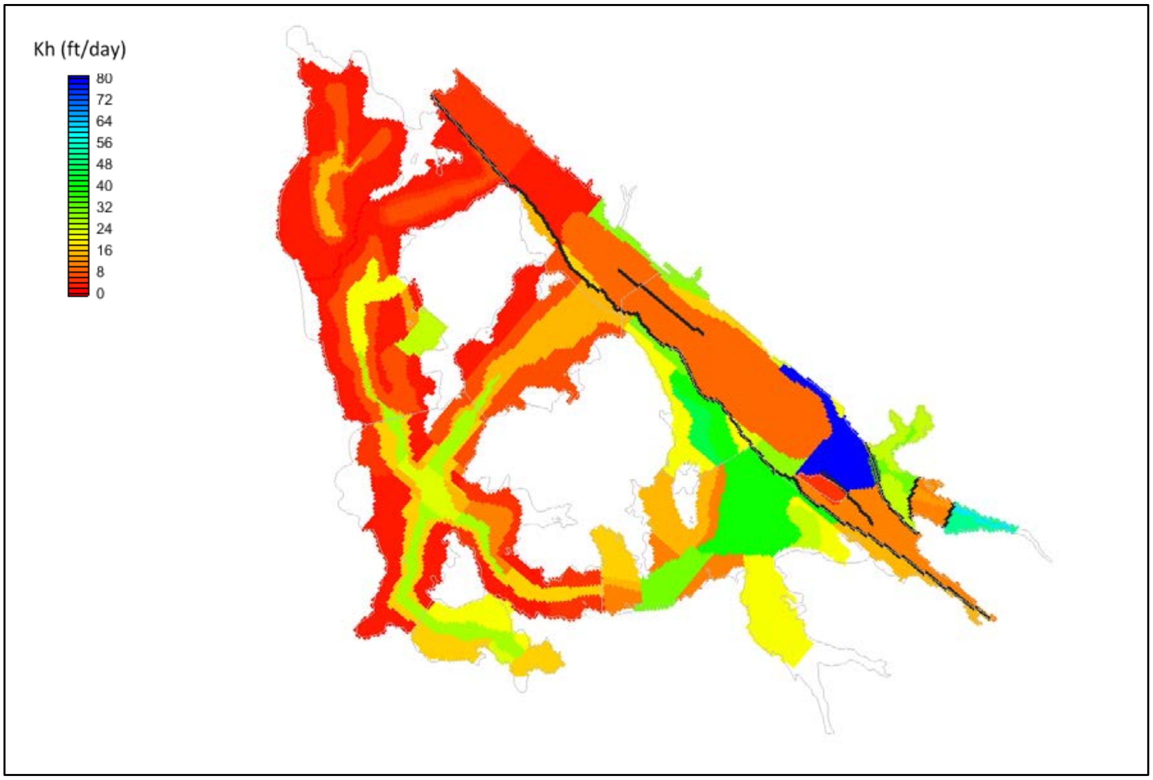

Figure 71: Calibrated Horizontal Hydraulic Conductivity – Layer 1

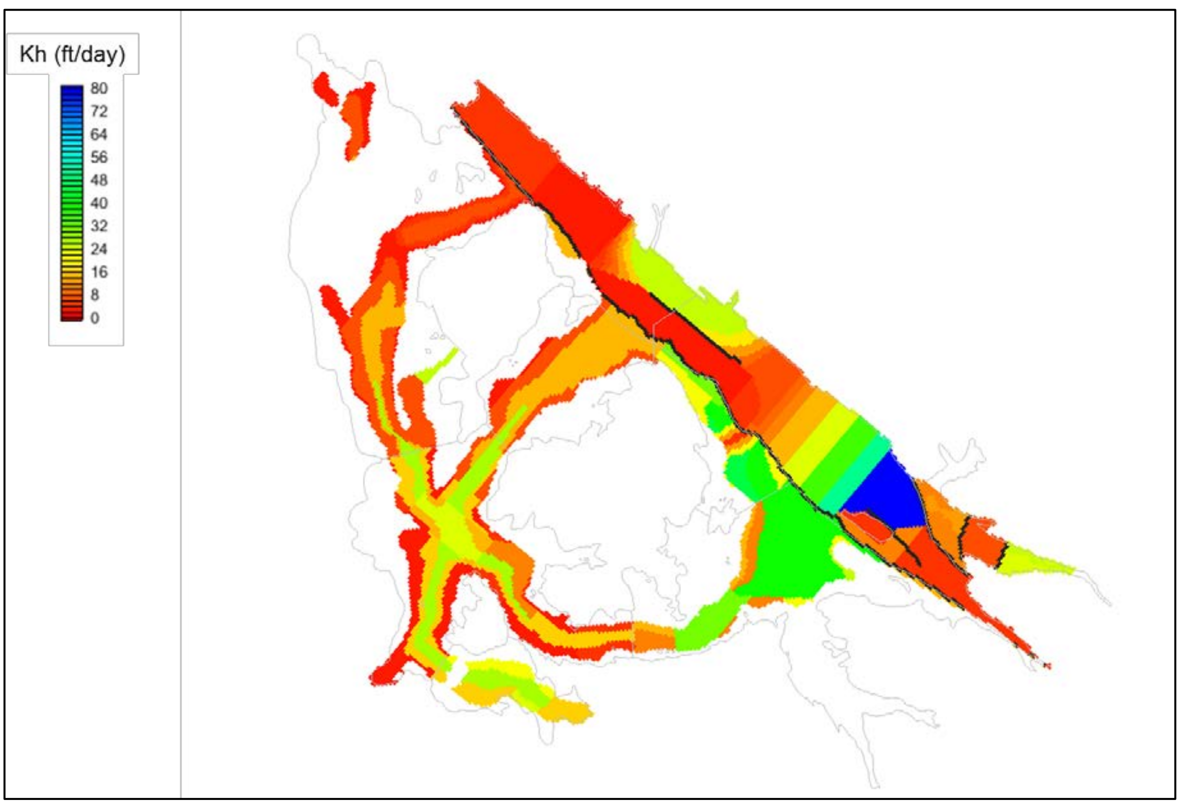

Figure 72: Calibrated Horizontal Hydraulic Conductivity – Layer 2

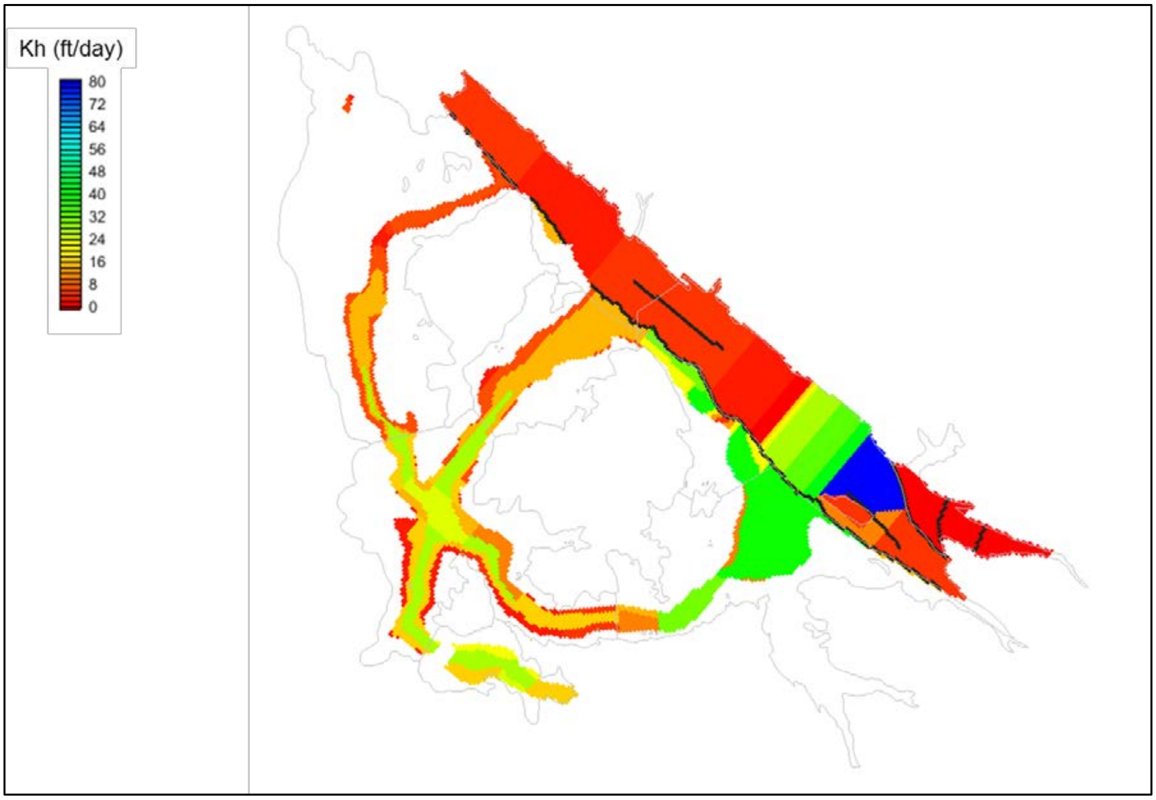

Figure 73: Calibrated Horizontal Hydraulic Conductivity – Layer 3

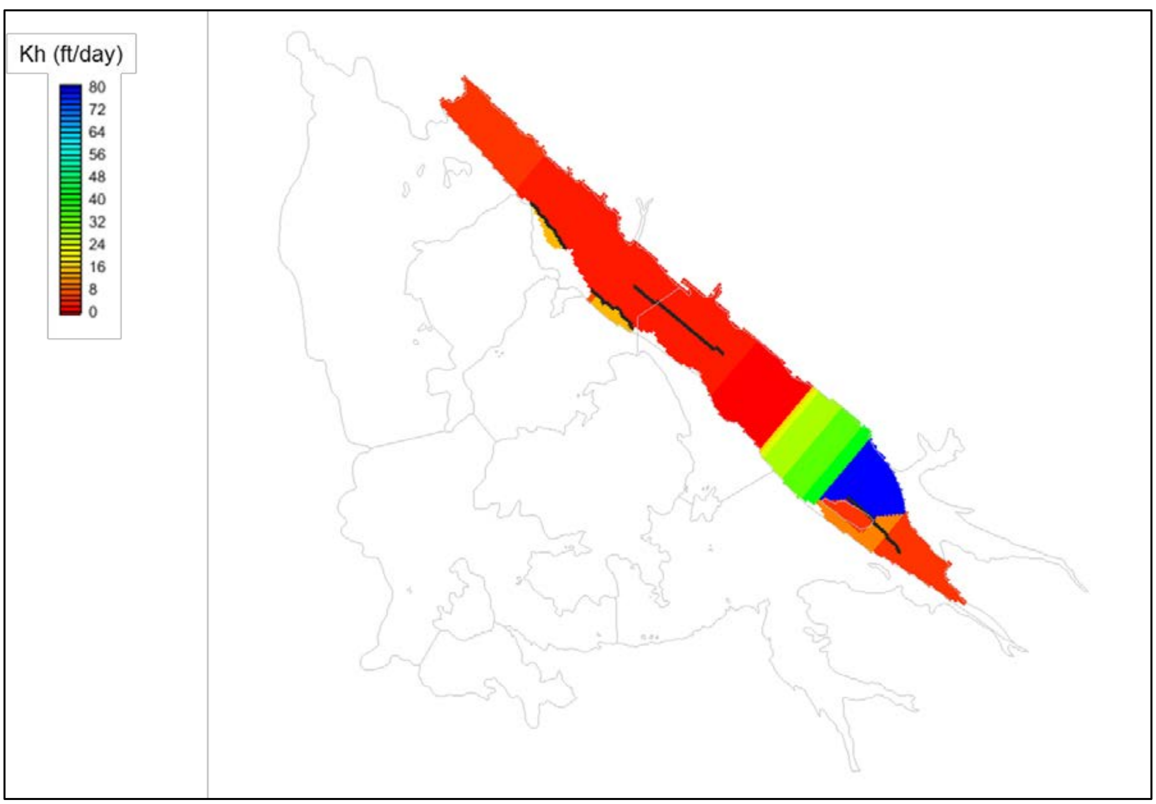

Figure 74: Calibrated Horizontal Hydraulic Conductivity – Layer 4

4.5.1.2 Vertical Hydraulic Conductivity

The final calibrated K_v distribution used in the model is presented in Figure 75 through Figure 78.

In general, the vertical hydraulic conductivities in the Basin followed the pattern of horizontal hydraulic conductivities and did not change between layers. This was attributed to the aquifer being mostly vertically homogeneous and lack of layer specific water level data. This is true for all GMZs in the Basin except for Upper Pressure, Canyon, and the band of K_v in Hemet North.

In Upper Pressure, the K_v of Layer 1 in the clay cap area was divided into three zones to represent the increase in thickness of the clay cap from south to north. In the southernmost portion of the clay cap, nearest to the intake area, the clay cap is generally less than or equal to 100 feet in thickness. Thickness increases to as much as 300 feet to the north. An incremental approach was used to model this change in thickness by assigning K_v values of 10%, 1% and 0.1% of K_h values, with the lowest K_v values corresponding to the thickest portions of the clay cap. The lowest K_v values occurred in the area of the groundwater depression, located west of the LP-UP construct in both Lower Pressure and Upper Pressure.

In the intake area, Layers 1 and 2 were separated by very low K_v values to represent a vertical gradient between the two layers. Layer 2 K_v values in the intake area were one of the lowest in the entire SJFM-2014.

Since the K_v values were calculated as a percentage of K_h values, the Canyon K_v values vary between layers corresponding to the changes in K_h between layers, as discussed in the previous section.

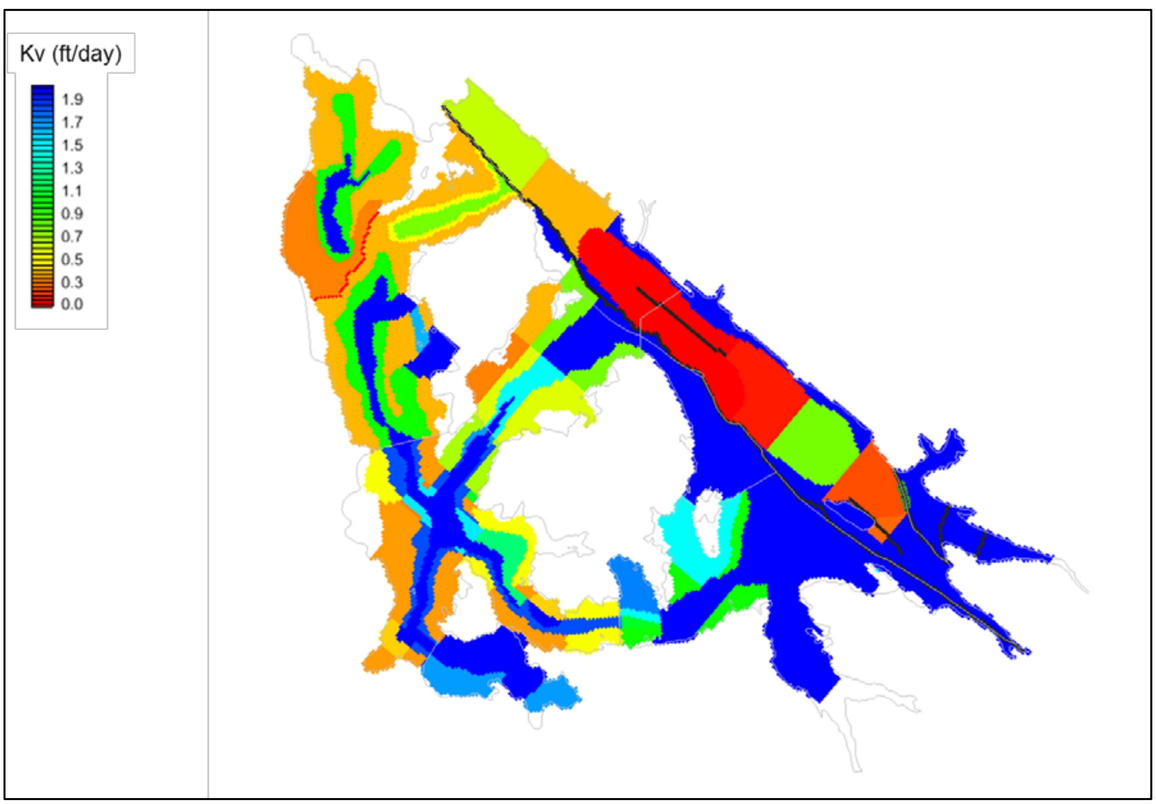

Figure 75: Calibrated Vertical Hydraulic Conductivity – Layer 1

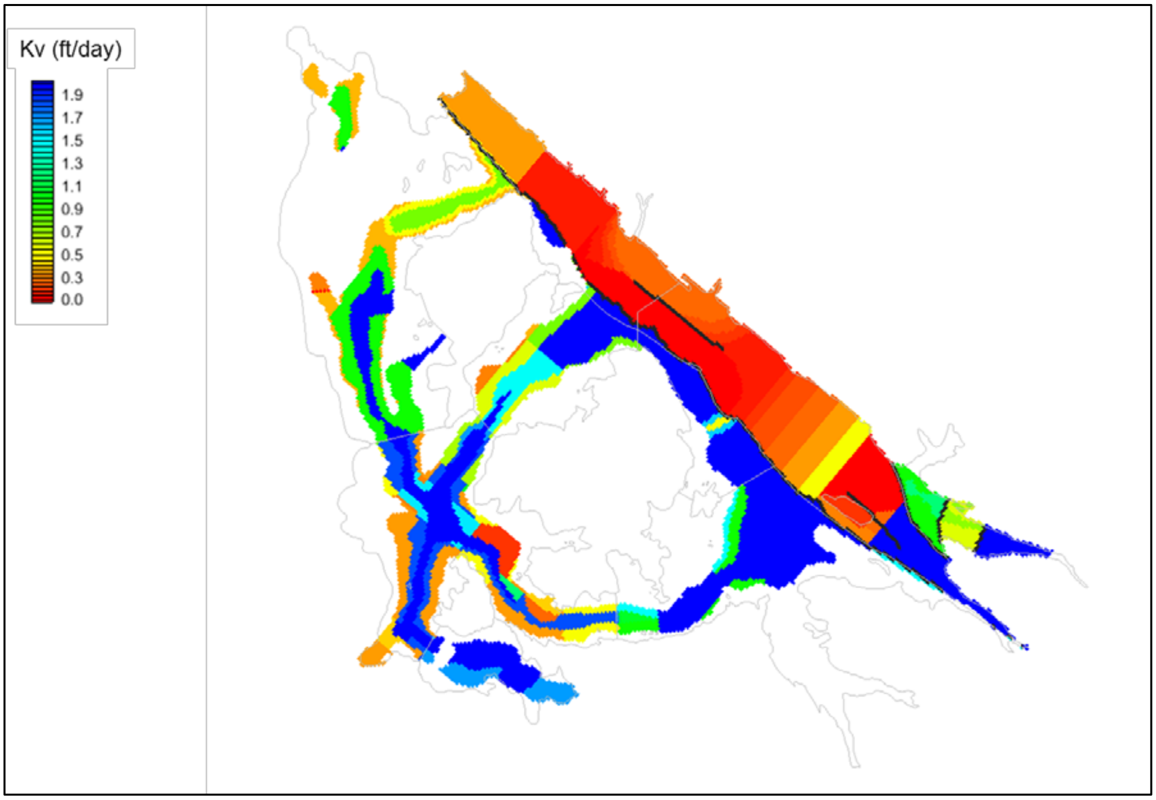

Figure 76: Calibrated Vertical Hydraulic Conductivity – Layer 2

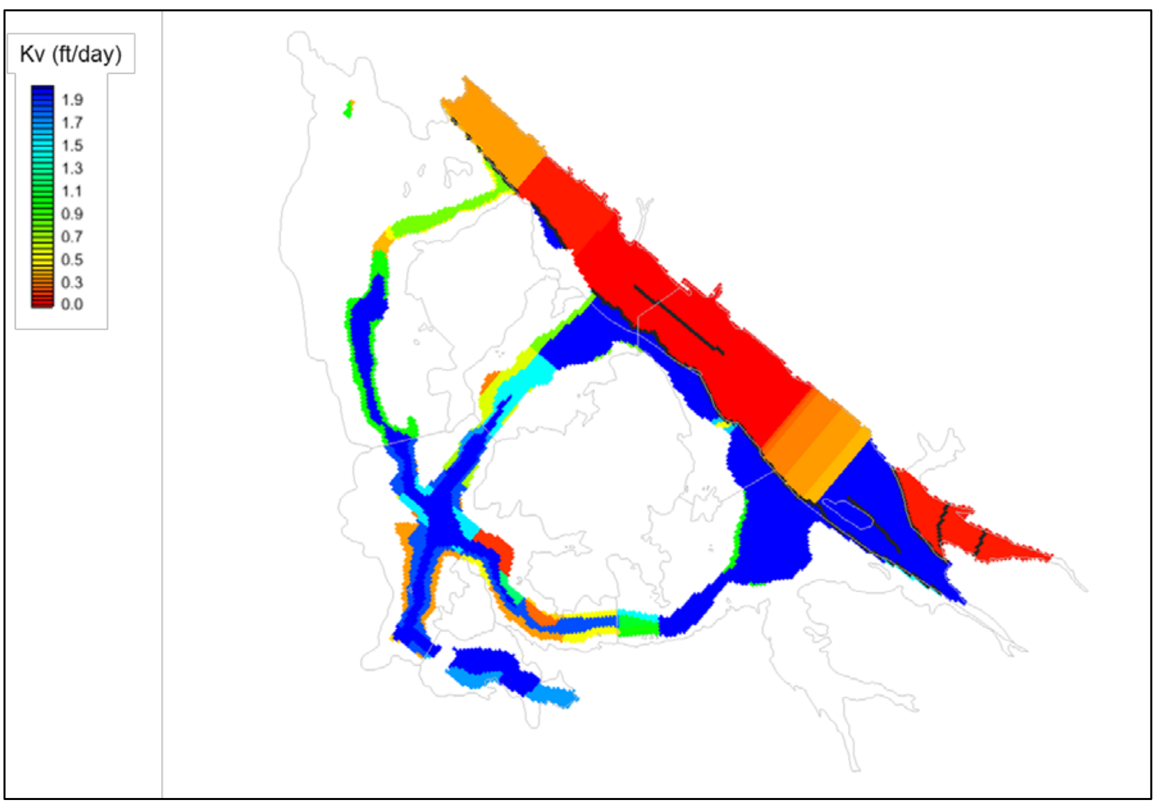

Figure 77: Calibrated Vertical Hydraulic Conductivity – Layer 3

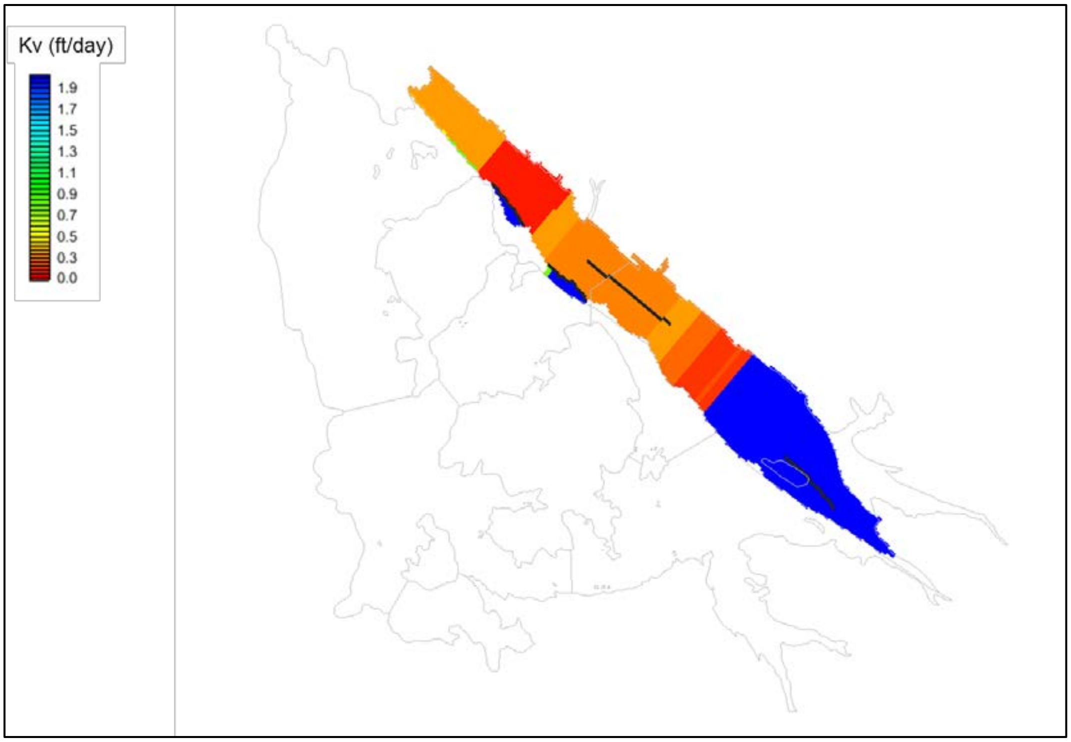

Figure 78: Calibrated Vertical Hydraulic Conductivity – Layer 4

4.5.1.3 Storage Parameters

Similar to the hydraulic conductivity adjustments in the calibration process, storage parameters were modified in an iterative manner, making isolated changes to the parameters in specific GMZs. Storage parameter changes were made based on distribution of hydraulic conductivities, groundwater extraction locations, and observed groundwater levels. Simulated groundwater levels were reviewed after each run until an acceptable level of calibration was reached.

Ranges for the calibrated specific yield and storage coefficient values for each GMZ are presented in Table 18. Layers 2 and 3 remained completely saturated throughout the duration of the study period except in a few locations of high bedrock in Hemet South and the Bautista Creek area in Upper Pressure. Layer 4 was saturated in the model at all times.

Table 18: Range of Specific Yield and Storage Parameters

GMZ	Specific Yield	Storage Coefficient
Perris North	0.07 – 0.085	$10x10^{-3}$ to $10x10^{-5}$
Perris South	0.08 – 0.16	$10x10^{-2}$ to $4x10^{-3}$
Menifee	0.20	$7x10^{-3}$
Lower Pressure	0.03 – 0.06	$10x10^{-2}$ to $8x10^{-3}$
Lakeview	0.10	$9x10^{-2}$
Hemet North	0.14	$9x10^{-3}$
Hemet South	0.11	$6x10^{-3}$
Upper Pressure	0.03 – 0.06	$2x10^{-2}$ to $8x10^{-3}$
Canyon	0.03 – 0.09	$2x10^{-4}$ to $2x10^{-5}$

4.5.2 *Water Budget*

As part of the water budget calibration, each inflow and outflow component was analyzed between runs. This included applied water recharge, river recharge, mountain front recharge, underflows and groundwater production. As shown in Table 19, applied water recharge, river recharge and mountain front recharge are important components in the water budget. These components were the focus of the water budget calibration.

Table 19: Percentages of the Basin Water Budget Components

Water Budget Component	Total Percentage of Inflow
Applied Water Recharge Inflow Component	*45%*
EMWD Sales	7%
Irrigation Recharge	7%
Rain Recharge	24%
Reclaimed Water Sales	3%
Subagency Sales	4%
Other Inflow Components	*55%*
Reclaimed/Recharge Ponds	10%
River Recharge	15%
Mountain Front Recharge	25%
Boundary Conditions (Reservoir Underflow)	5%
Outflow Components	
Groundwater Production	100%

An important part of the water budget calibration process was estimation of recharge from percolation of applied water components. Based on the applied water input data, historical trends and discussions with EMWD, percolation factors were modified to better represent the amount of applied water recharging into the groundwater. Approximately 11 percent of the total applied water percolates down and recharges the aquifer. The percent recharged for each applied water component is provided in Table 20.

Table 20: Percent of Applied Water Recharged to the Basin

Applied Water Component	Percentage Recharged
EMWD Sales	11%
Irrigation	13%
Rain	9%
Reclaimed Water	10%
Subagency Sales	11%
San Jacinto Basin – All Applied Water Components	11%

The San Jacinto River flows were calibrated based on estimates in the Canyon Basin Operating Plan. The Canyon Basin Operating Plan estimates that 95% of all San Jacinto River recharge is recharged in Upper Pressure and Canyon (20% and 75%, respectively). Analyzing water budgets between calibration runs ensured that the San Jacinto River did not recharge more than what was expected downstream. Streambed hydraulic conductivities were modified between runs to best simulate the appropriate recharge. The range of streambed hydraulic conductivity (K_b) values are presented in Section 3.9.

Mountain front recharge was refined based on balancing the water budget inflows and outflows and discussions with EMWD. Additional information on mountain front recharge calibration is presented in Section 3.10.1.

Water budget tables were developed for each GMZ, the Hemet-San Jacinto Groundwater Management Area, the West San Jacinto Management Area, and the entire Basin. Water budgets from the calibrated SJFM-2014 for the entire Basin and the two groundwater management areas are provided in Table 21 through Table 23, respectively. Annual calibrated water budget tables for all areas are provided in Appendix E.

Table 21: Numerical Model Water Budget for the EMWD San Jacinto Groundwater Basin

2014 Model

		Flow In (ac-ft)											Flow Out[1] (ac-ft)		
Model Year	Calendar Year	EMWD Sales Recharge	Irrigation Recharge	Rain Recharge	Recycled Water Sales	Subagency Sales Recharge	Reclaimed Water Facilities/ Recharge Ponds	Perris Drain	SJ River/Bautista Creek Recharge	Underflow from Lake Perris	Mountain Front Recharge	Total Flow In (ac-ft)	GW Extraction	Total Flow Out (ac-ft)	Change In Storage (ac-ft)
1	1984	3,832	5,679	13,542	430	2,308	3,431	301	10,413	3,786	15,072	58,795	63,308	63,308	-4,513
2	1985	3,442	6,176	12,206	832	2,537	2,936	300	9,766	3,786	15,796	57,777	67,144	67,144	-9,367
3	1986	3,373	5,974	18,831	951	2,638	2,158	300	11,996	3,786	19,503	69,510	65,225	65,225	4,286
4	1987	3,897	5,757	19,017	1,101	2,728	2,709	300	2,341	3,786	20,083	61,720	64,647	64,647	-2,927
5	1988	4,433	5,703	14,147	1,259	2,878	3,043	301	1,088	3,786	14,835	51,474	67,773	67,773	-16,299
6	1989	5,049	5,804	7,586	1,394	2,992	3,390	300	2,361	3,786	10,728	43,390	70,253	70,253	-26,863
7	1990	5,010	5,285	11,276	1,466	3,459	4,252	300	446	3,786	15,023	50,305	67,288	67,288	-16,983
8	1991	3,926	4,934	22,623	1,290	2,742	3,805	300	14,073	3,786	22,897	80,376	60,615	60,615	19,761
9	1992	4,062	5,187	29,330	1,131	2,828	4,128	301	22,257	3,786	27,773	100,783	63,232	63,232	37,551
10	1993	4,084	5,671	37,291	1,571	2,278	5,991	300	32,975	3,786	32,957	126,903	63,545	63,545	63,358
11	1994	4,121	5,933	15,788	1,282	2,935	6,106	300	13,477	3,786	16,391	70,119	73,545	73,545	-3,426
12	1995	4,131	6,455	29,158	1,732	2,709	6,710	300	27,324	3,786	27,745	110,049	74,635	74,635	35,415
13	1996	4,543	6,338	18,938	1,863	3,202	6,813	301	8,163	3,786	18,938	72,884	82,839	82,839	-9,955
14	1997	4,662	7,088	13,247	1,994	3,269	7,351	300	7,447	3,786	15,598	64,741	86,924	86,924	-22,184
15	1998	4,179	6,310	31,924	1,524	2,569	8,395	300	33,316	3,786	30,106	122,410	75,824	75,824	46,586
16	1999	5,071	6,938	8,528	2,157	3,359	8,347	300	2,084	3,786	12,241	52,811	85,862	85,862	-33,051
17	2000	5,614	7,771	13,785	2,059	3,533	8,639	301	2,388	3,786	14,190	62,066	88,187	88,187	-26,121
18	2001	5,574	6,605	16,622	2,058	3,450	8,922	300	2,084	3,786	14,833	64,233	78,513	78,513	-14,280
19	2002	5,851	5,305	8,465	2,945	3,792	10,289	300	1,499	3,786	11,240	53,472	70,889	70,889	-17,417
20	2003	5,755	4,052	22,158	1,559	3,078	9,542	300	6,691	3,786	19,445	76,365	62,403	62,403	13,961
21	2004	6,473	4,489	25,852	1,771	3,591	11,012	301	9,138	3,786	21,232	87,645	64,716	64,716	22,929
22	2005	6,515	3,754	25,421	1,840	2,731	11,127	300	30,837	3,786	24,834	111,145	59,817	59,817	51,328
23	2006	7,227	3,979	12,222	1,785	3,597	11,218	300	10,909	3,786	15,321	70,345	73,903	73,903	-3,558
24	2007	6,209	3,801	7,972	2,607	3,544	10,142	300	2,790	3,786	12,631	53,783	72,090	72,090	-18,307
25	2008	5,774	3,376	15,916	2,912	2,938	10,118	301	11,266	3,786	18,454	74,840	64,223	64,223	10,616
26	2009	5,256	2,665	8,725	3,355	2,828	9,920	300	4,931	3,786	13,378	55,143	57,682	57,682	-2,538
27	2010	4,740	2,599	28,123	2,885	2,646	10,164	300	17,027	3,786	28,091	100,362	56,273	56,273	44,089
28	2011	5,024	2,665	12,165	2,230	2,808	10,099	300	6,197	3,786	15,705	60,980	58,734	58,734	2,246
29	2012	5,402	2,599	10,193	2,675	2,699	10,099	301	2,695	3,786	13,471	53,922	59,354	59,354	-5,433
1984-1999 Average		4,238	5,952	18,964	1,374	2,839	4,973	300	12,470	3,786	19,730	74,628	70,791	70,791	3,837
2000-2012 Average		5,801	4,128	15,971	2,360	3,172	10,099	300	8,342	3,786	17,140	71,100	66,676	66,676	4,424
1984-2012 Average		4,939	5,134	17,622	1,816	2,988	7,271	300	10,620	3,786	18,569	73,046	68,946	68,946	4,100
1984-2012 Max		7,227	7,771	37,291	3,355	3,792	11,218	301	33,316	3,786	32,957	126,903	88,187	88,187	63,358
1984-2012 Min		3,373	2,599	7,586	430	2,278	2,158	300	446	3,786	10,728	43,390	56,273	56,273	-33,051
1984-2012 Std		966	1,436	7,975	690	404	3,002	0	9,720	0	5,943	22,493	8,823	8,823	25,494

Notes:
1) A positive value for outflow data represents water flowing out of the basin

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Table 22: Numerical Model Water Budget for the Hemet-San Jacinto Groundwater Management Area

2014 Model

Model Year	Calendar Year	Flow In (ac-ft)									Total Flow In (ac-ft)	Flow Out[1] (ac-ft)			Total Flow Out (ac-ft)	Change in Storage (ac-ft)
		EMWD Sales Recharge	Irrigation Recharge	Rain Recharge	Recycled Water Sales	Subagency Sales Recharge	SJ River/Bautista Ck Recharge	Reclaimed Water Facilities/ Recharge Ponds	Mtn Front Recharge	Underflow from Lower Pressure		Underflow to Perris South	Underflow to Lakeview	GW Extraction		
1	1984	1,674	4,015	6,862	346	2,195	10,413	1,109	6,687	2,667	35,968	144	951	49,131	50,227	-14,259
2	1985	1,467	4,581	6,714	676	2,442	9,766	953	7,152	3,762	37,512	177	1,116	53,855	55,148	-17,635
3	1986	1,523	4,461	9,575	761	2,512	11,988	737	9,463	3,093	44,112	188	785	54,144	55,117	-11,004
4	1987	1,707	4,279	9,964	750	2,605	2,341	893	9,824	3,065	35,430	194	651	52,568	53,413	-17,982
5	1988	1,993	4,213	6,789	827	2,742	1,088	985	6,539	2,839	28,015	200	822	55,001	56,024	-28,009
6	1989	2,358	4,127	3,786	921	2,839	2,361	1,097	3,993	2,514	23,995	203	706	55,728	56,636	-32,641
7	1990	2,010	3,915	6,305	741	3,321	446	1,648	6,490	2,630	27,505	207	658	54,189	55,053	-27,548
8	1991	1,424	3,661	11,594	629	2,605	14,073	1,466	11,259	2,726	49,437	214	596	49,503	50,313	-876
9	1992	1,371	3,708	14,689	527	2,671	22,247	1,573	14,199	2,836	63,820	223	528	49,560	50,311	13,509
10	1993	1,374	4,041	18,768	568	2,138	32,926	1,441	17,353	2,830	81,439	238	512	49,276	50,025	31,413
11	1994	1,304	3,838	7,767	404	2,795	13,465	1,272	7,318	3,056	41,218	246	538	59,153	59,937	-18,719
12	1995	1,331	4,266	14,595	656	2,557	27,282	1,585	14,196	3,448	69,916	255	501	56,192	56,948	12,967
13	1996	1,530	3,912	9,171	729	3,049	8,163	1,403	8,847	3,866	40,670	263	557	61,961	62,781	-22,111
14	1997	1,617	4,301	7,045	763	3,102	7,446	1,651	6,837	3,922	36,685	264	647	62,870	63,782	-27,096
15	1998	1,409	4,126	16,547	661	2,425	33,268	1,576	15,626	3,942	79,581	269	679	58,144	59,092	20,489
16	1999	1,699	4,566	4,771	842	3,191	2,084	1,245	4,804	3,992	27,195	271	622	64,404	65,297	-38,102
17	2000	1,834	5,277	6,509	788	3,358	2,388	1,245	5,971	3,958	31,327	274	552	66,739	67,565	-36,238
18	2001	1,811	4,519	7,350	751	3,292	2,084	1,245	6,467	4,236	31,755	270	467	60,579	61,315	-29,561
19	2002	1,841	3,602	4,071	992	3,622	1,499	2,320	4,312	4,267	26,525	264	472	51,893	52,629	-26,104
20	2003	1,815	2,588	10,256	534	2,927	6,691	1,288	9,427	4,164	39,689	259	408	45,752	46,419	-6,730
21	2004	2,035	3,138	11,373	702	3,409	9,138	2,469	10,527	4,247	47,037	254	464	48,135	48,853	-1,816
22	2005	2,015	2,792	14,006	650	2,560	30,823	2,583	12,786	4,151	72,366	257	620	45,938	46,815	25,551
23	2006	2,250	2,951	6,546	564	3,411	10,906	2,674	6,934	4,209	40,446	251	679	52,355	53,285	-12,839
24	2007	1,986	2,912	4,179	980	3,328	2,790	1,599	5,237	4,409	27,420	253	595	50,865	51,713	-24,293
25	2008	1,857	2,550	7,770	1,604	2,757	11,266	1,574	8,897	4,464	42,738	263	601	46,456	47,321	-4,582
26	2009	1,717	2,291	4,822	1,938	2,688	4,931	1,377	5,709	4,226	29,697	265	633	41,761	42,659	-12,961
27	2010	1,543	2,007	13,434	1,842	2,521	17,027	1,620	14,991	4,108	59,093	274	669	38,580	39,523	19,570
28	2011	1,597	2,291	6,306	415	2,669	6,197	1,556	7,177	4,121	32,327	291	589	39,715	40,595	-8,268
29	2012	1,718	2,007	4,989	433	2,574	2,695	1,556	5,754	4,244	25,969	298	533	39,720	40,551	-14,582
1984-1999 Average		1,612	4,126	9,684	675	2,699	12,460	1,290	9,412	3,199	45,156	222	679	55,355	56,256	-11,100
2000-2012 Average		1,848	2,994	7,816	938	3,009	8,341	1,777	8,014	4,216	38,953	267	560	48,345	49,173	-10,219
1984-2012 Average		1,718	3,618	8,847	793	2,838	10,613	1,508	8,785	3,655	42,375	242	626	52,213	53,081	-10,705
1984-2012 Max		2,358	5,277	18,768	1,938	3,622	33,268	2,674	17,353	4,464	81,439	298	1,116	66,739	67,565	31,413
1984-2012 Min		1,304	2,007	3,786	346	2,138	446	737	3,993	2,514	23,995	144	408	38,580	39,523	-38,102
1984-2012 Std		270	864	3,950	378	387	9,708	470	3,606	640	16,378	36	146	7,289	7,292	18,759

Notes:

1) A positive value for outflow data represents water flowing out of the basin

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Table 23: Numerical Model Water Budget for the West San Jacinto Groundwater Management Area

2014 Model

		Flow In (ac-ft)													Flow Out[1] (ac-ft)			
Model Year	Calendar Year	EMWD Sales Recharge	Irrigation Recharge	Rain Recharge	Recycled Water Sales	Subagency Sales Recharge	Reclaimed Water Facilities	Perris Drain Leakage	San Jacinto River Leakage	Underflow from Lake Perris	Mountain Front Recharge	Underflow from Hemet North	Underflow from Hemet South	Total Flow In (ac-ft)	Underflow to Upper Pressure	GW Extraction	Total Flow Out (ac-ft)	Change in Storage (ac-ft)
1	1984	2,159	1,664	6,680	84	113	2,323	301	0	3,786	8,385	951	144	26,590	2,667	14,177	16,844	9,746
2	1985	1,975	1,595	5,492	156	95	1,983	300	0	3,786	8,644	1,116	177	25,319	3,762	13,289	17,050	8,269
3	1986	1,850	1,513	9,256	190	127	1,422	300	8	3,786	10,040	785	188	29,463	3,093	11,080	14,173	15,290
4	1987	2,190	1,478	9,053	351	123	1,816	300	0	3,786	10,258	651	194	30,200	3,065	12,079	15,145	15,055
5	1988	2,440	1,490	7,358	432	136	2,058	301	0	3,786	8,296	822	200	27,320	2,839	12,772	15,611	11,709
6	1989	2,692	1,677	3,799	474	153	2,293	300	0	3,786	6,735	706	203	22,818	2,514	14,526	17,040	5,778
7	1990	3,000	1,370	4,971	725	139	2,604	300	0	3,786	8,534	658	207	26,294	2,630	13,099	15,729	10,565
8	1991	2,502	1,273	11,029	661	137	2,339	300	0	3,786	11,638	596	214	34,475	2,726	11,112	13,838	20,637
9	1992	2,691	1,479	14,642	604	158	2,555	301	10	3,786	13,574	528	223	40,550	2,836	13,672	16,508	24,042
10	1993	2,710	1,630	18,522	1,003	140	4,551	300	49	3,786	15,604	512	238	49,045	2,830	14,270	17,100	31,945
11	1994	2,817	2,095	8,022	878	141	4,833	300	12	3,786	9,073	538	246	32,740	3,056	14,392	17,448	15,293
12	1995	2,799	2,189	14,563	1,077	152	5,125	300	42	3,786	13,549	501	255	44,338	3,448	18,443	21,891	22,447
13	1996	3,013	2,426	9,767	1,134	152	5,410	301	0	3,786	10,090	557	263	36,900	3,866	20,878	24,744	12,156
14	1997	3,045	2,786	6,202	1,230	167	5,700	300	1	3,786	8,760	647	264	32,889	3,922	24,054	27,976	4,913
15	1998	2,770	2,184	15,377	863	144	6,820	300	48	3,786	14,480	679	269	47,719	3,942	17,680	21,622	26,097
16	1999	3,372	2,372	3,757	1,314	168	7,103	300	0	3,786	7,437	622	271	30,501	3,992	21,457	25,450	5,051
17	2000	3,781	2,495	7,276	1,271	174	7,394	301	0	3,786	8,219	552	274	35,522	3,958	21,448	25,406	10,117
18	2001	3,762	2,086	9,272	1,307	159	7,677	300	0	3,786	8,365	467	270	37,451	4,236	17,935	22,171	15,281
19	2002	4,010	1,703	4,394	1,953	170	7,969	300	0	3,786	6,928	472	264	31,950	4,267	18,996	23,263	8,687
20	2003	3,940	1,464	11,902	1,025	151	8,254	300	0	3,786	10,018	408	259	41,506	4,164	16,651	20,815	20,691
21	2004	4,438	1,352	14,478	1,070	182	8,544	301	0	3,786	10,705	464	254	45,573	4,247	16,581	20,828	24,745
22	2005	4,500	962	11,415	1,190	171	8,544	300	15	3,786	12,048	620	257	43,807	4,151	13,878	18,030	25,777
23	2006	4,977	1,028	5,676	1,221	187	8,544	300	3	3,786	8,386	679	251	35,038	4,209	21,547	25,757	9,281
24	2007	4,223	889	3,793	1,628	216	8,544	300	0	3,786	7,393	595	253	31,620	4,409	21,225	25,634	5,986
25	2008	3,917	827	8,146	1,308	181	8,544	301	0	3,786	9,557	601	263	37,430	4,464	17,767	22,232	15,198
26	2009	3,539	374	3,903	1,416	140	8,544	300	0	3,786	7,669	633	265	30,570	4,226	15,921	20,147	10,423
27	2010	3,197	592	14,689	1,043	124	8,544	300	0	3,786	13,101	669	274	46,319	4,108	17,693	21,801	24,519
28	2011	3,426	374	5,859	1,815	140	8,544	300	0	3,786	8,528	589	291	33,653	4,121	19,018	23,139	10,514
29	2012	3,685	592	5,204	2,242	125	8,544	301	0	3,786	7,718	533	298	33,028	4,244	19,634	23,878	9,149
1984-1999 Average		2,626	1,826	9,281	698	140	3,683	300	11	3,786	10,319	679	222	33,573	3,199	15,436	18,636	14,937
2000-2012 Average		3,953	1,134	8,154	1,422	163	8,322	300	1	3,786	9,126	560	267	37,190	4,216	18,330	22,546	14,644
1984-2012 Average		3,221	1,516	8,776	1,023	150	5,763	300	6	3,786	9,784	626	242	35,194	3,655	16,734	20,389	14,806
1984-2012 Max		4,977	2,786	18,522	2,242	216	8,544	301	49	3,786	15,604	1,116	298	49,045	4,464	24,054	27,976	31,945
1984-2012 Min		1,850	374	3,757	84	95	1,422	300	0	3,786	6,735	408	144	22,818	2,514	11,080	13,838	4,913
1984-2012 Std		789	633	4,100	519	25	2,698	0	14	0	2,344	146	36	7,020	640	3,483	3,952	7,341

Notes:

1) A positive value for outflow data represents water flowing out of the basin

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4.5.3 *Calibration Statistics*

The calibrated model achieved and surpassed calibration residual goal of +/-20 feet described in Section 4.3. The second residual goal of +/-30 feet was almost achieved. Sixty-two percent of groundwater level residuals were within +/- 20 feet and seventy-four percent of groundwater elevation residuals were within +/- 30 feet. Groundwater elevation residual statistics are provided in Table 24. Histograms of the residual for the entire Basin, as illustrated in Figure 79, shows that the majority of the residuals are within +/- 30 feet. Additional calibration statistics and figures for each GMZ are provided in Appendix C. Average residuals maps for 2000, 2005 and 2010, shown in Figure 80 through Figure 82, show the calibration performance of the SJFM-2014 at all calibration wells in the later years of the simulation period. Most of the calibration wells in the areas of the Basin with significant groundwater production show average residuals within +/- 20 feet.

It should be noted that Lower Pressure is a heavily convoluted and complicated flow system with few apparent continuous aquifers. This causes results in the area to be less accurate than in area of extensive horizontally continuous aquifers, such as the other GMZs in the Basin. Since the water resources within Lower pressure appear limited and installation of a groundwater production well is minimal due to the nature of the aquifer in this region, a limited amount of time was spent during calibration efforts. Subsequently, the overall averages of the entire basin are reduced due to an area that is not planned for municipal groundwater extraction. The results in Lower Pressure are of limited value.

Table 24: Groundwater Elevation Residual Statistics – Number of Data Points within Residual Range

GMZ	0 to +/- 10 ft	0 to +/- 20 ft	0 to +/- 30 ft	0 to +/- 40 ft	0 to +/- 60 ft	0 to +/- 80 ft	0 to +/- 100 ft	0 to +/- >100 ft
Perris North	33%	73%	93%	98%	100%	100%	100%	100%
Perris South	61%	83%	90%	91%	95%	97%	99%	100%
Menifee	40%	84%	99%	100%	100%	100%	100%	100%
Lower Pressure	6%	11%	19%	30%	45%	54%	61%	100%
Lakeview	56%	81%	90%	98%	99%	100%	100%	100%
Hemet North	60%	81%	92%	97%	99%	99%	100%	100%
Hemet South	59%	89%	95%	97%	98%	100%	100%	100%
Upper Pressure	27%	47%	61%	69%	81%	86%	89%	100%
Canyon	11%	24%	34%	47%	69%	87%	96%	100%
Hemet-San Jacinto Management Zone	35%	57%	68%	74%	85%	91%	94%	100%
West San Jacinto Management Zone	42%	73%	85%	89%	93%	95%	96%	100%
West San Jacinto Management Zone (without Lower Pressure)	46%	79%	92%	95%	98%	99%	100%	100%
Entire Basin	38%	62%	74%	80%	88%	92%	95%	100%
Entire Basin (without Lower Pressure)	**39%**	**64%**	**75%**	**81%**	**89%**	**94%**	**96%**	**100%**

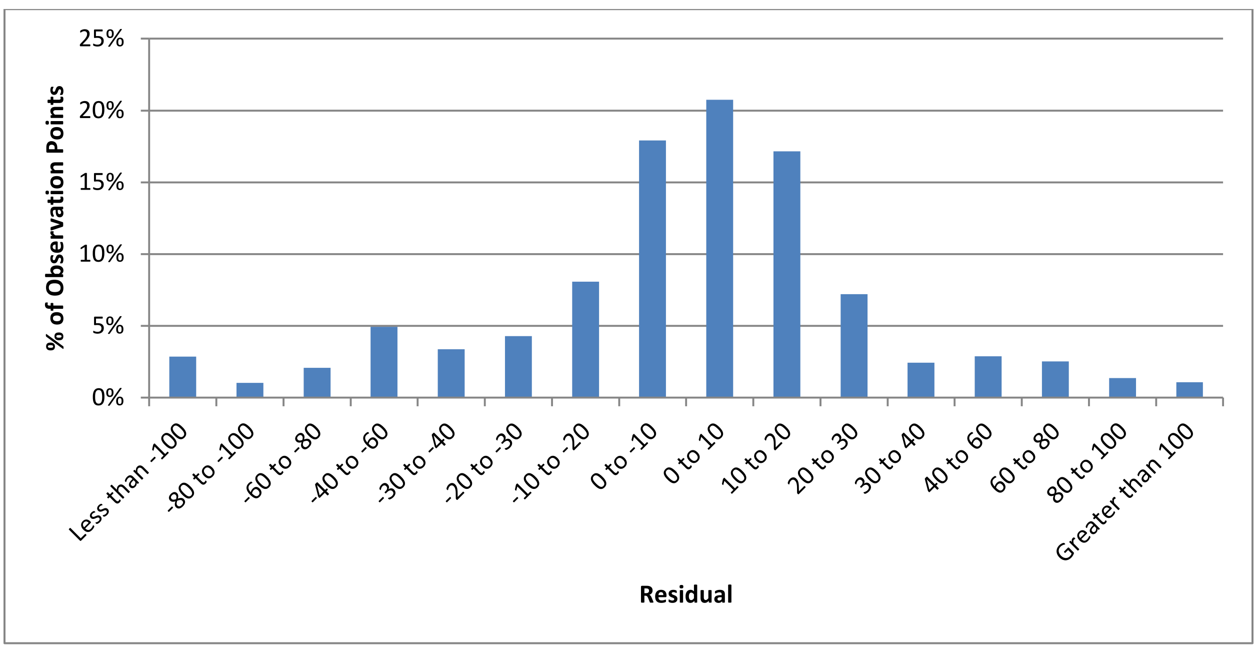


Figure 79: Histogram of Groundwater Elevation Residuals in the San Jacinto Groundwater Basin (without Lower Pressure)

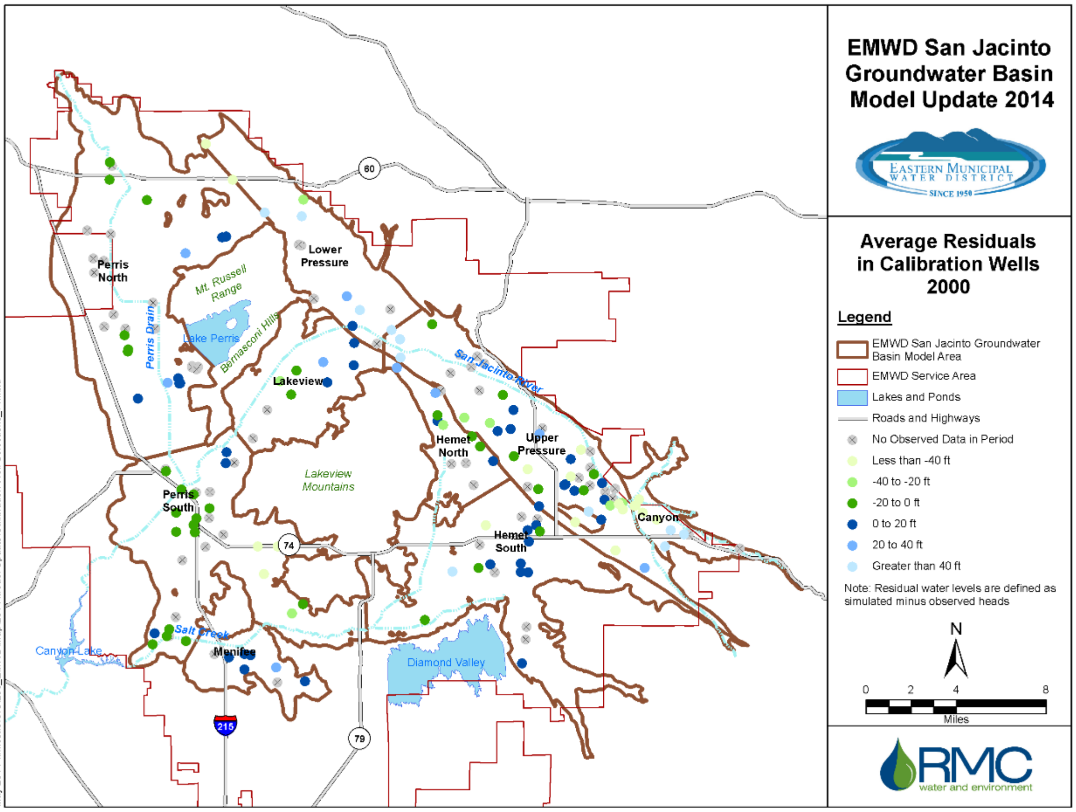


Figure 80: Average Residuals in Calibration Wells for 2000

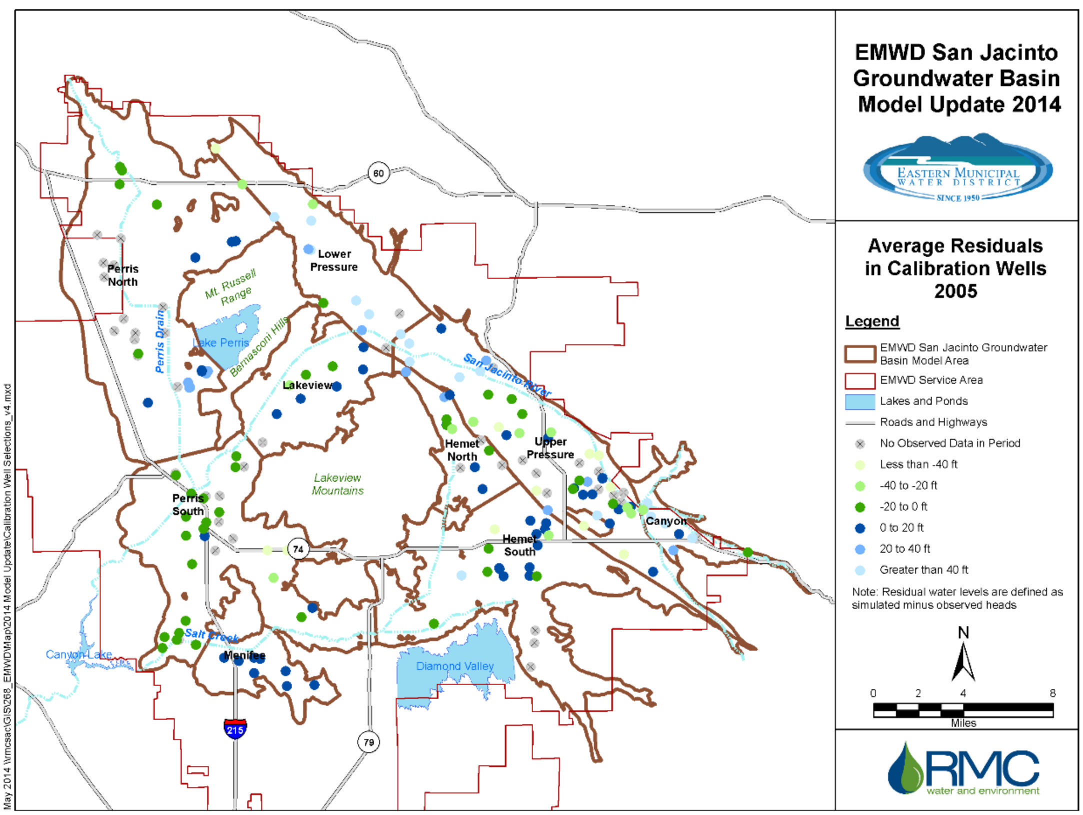


Figure 81: Average Residuals in Calibration Wells for 2005

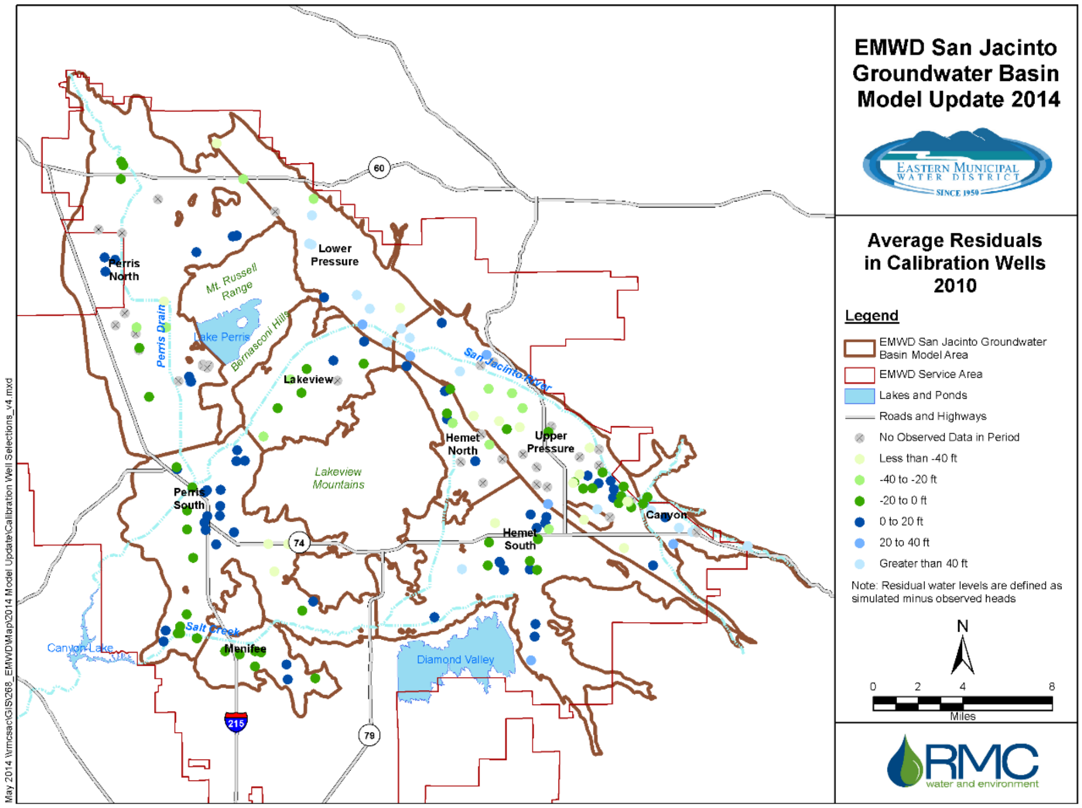


Figure 82: Average Residuals in Calibration Wells for 2010

Scatter plots comparing simulated and observed heads are commonly used to present the calibration status of groundwater models. An ideal fit trends along the 1:1 correlation line. Values above the line represent measurements where simulated values have been overestimated in comparison to the observed data and vice versa for values below the line. A scatterplot for all wells in the Basin is provided in Figure 83. In general, the points follow the trend of the 1:1 correlation line, showing a good match for the model.

Two other scatter point analyses were evaluated: residual heads versus simulated heads and residual heads over time. Data for both analyses are expected to fall along the zero line of the x-axis. These plots for the SJFM-2014 are shown in Figure 84 and Figure 85, respectively. In the residual head versus simulated heads graph, a majority of the data points are within 40 feet, as expected based on the histograms. In the residual heads over time plot more data becomes available in later years and data generally concentrates around the zero foot residual line. This plot also encircles the expected data trends and majority of the data points fall within this area.

The scatterplots show a good match of the observed and simulated heads; however, there are four outlier wells in Lower Pressure and Upper Pressure that are outside of the expected trend for calibrated data, indicating that the simulation of these wells need improvement in the future updates of the model when more data becomes available. These wells are listed in Table 25 along with a description explaining the reason for discrepancies in the model. The outlier data points from these wells are outside the expected, circled data in the scatterplots. The locations of these wells are provided in Figure 86.

Table 25: Wells Outside of Expected Calibration Trend

Well Name	GMZ	Calibration Discrepancy Explanation
EMWD 42 Reche Canyon	Lower Pressure	• Located in an isolated environment, water levels behave like the capillary effect. Well selected due to CASGEM status.
21 Gun Club	Lower Pressure	• Located in the groundwater depression area between Lower and Upper Pressure • Additional observed data and refined aquifer parameters will improve calibration of this well in the future
Fish & Game Rhodda	Lower Pressure	• Located in the groundwater depression area between Lower and Upper Pressure • Additional observed data and refined aquifer parameters will help improve calibration of this area in the future
Fish & Game Bouris	Lower Pressure	• Located in Layer 2 right next to another calibration well in Layer 1, but observed water levels only differ by 100 feet • A more localized model would help capture the differences in water levels between layers in the same area
LHMWD A	Upper Pressure	• Located in Layer 1 just north of where the bedrock in the basin drops from approximately 1,300 feet to -200 feet • Simulated water levels drop significantly with the change in geology and Layer 1 is simulated as dry as a result • Additional observed data and refined aquifer parameters will help improve calibration of this area in the future

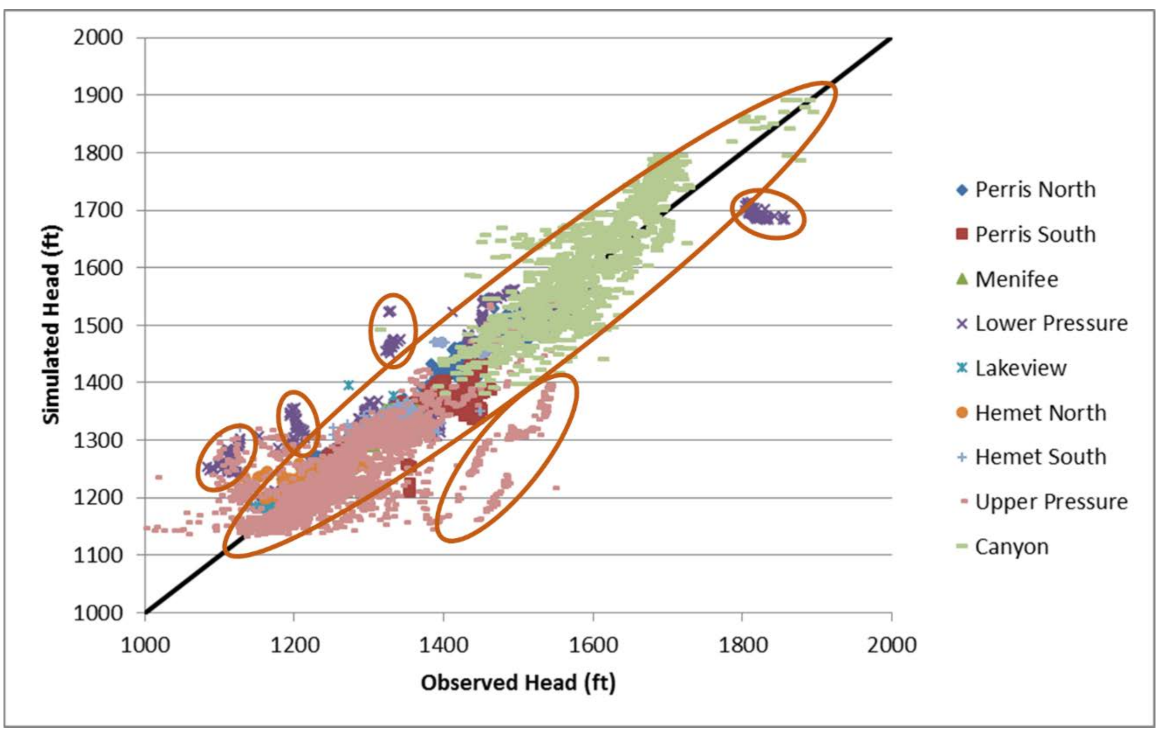


Figure 83: Simulated vs. Observed Values for the San Jacinto Groundwater Basin

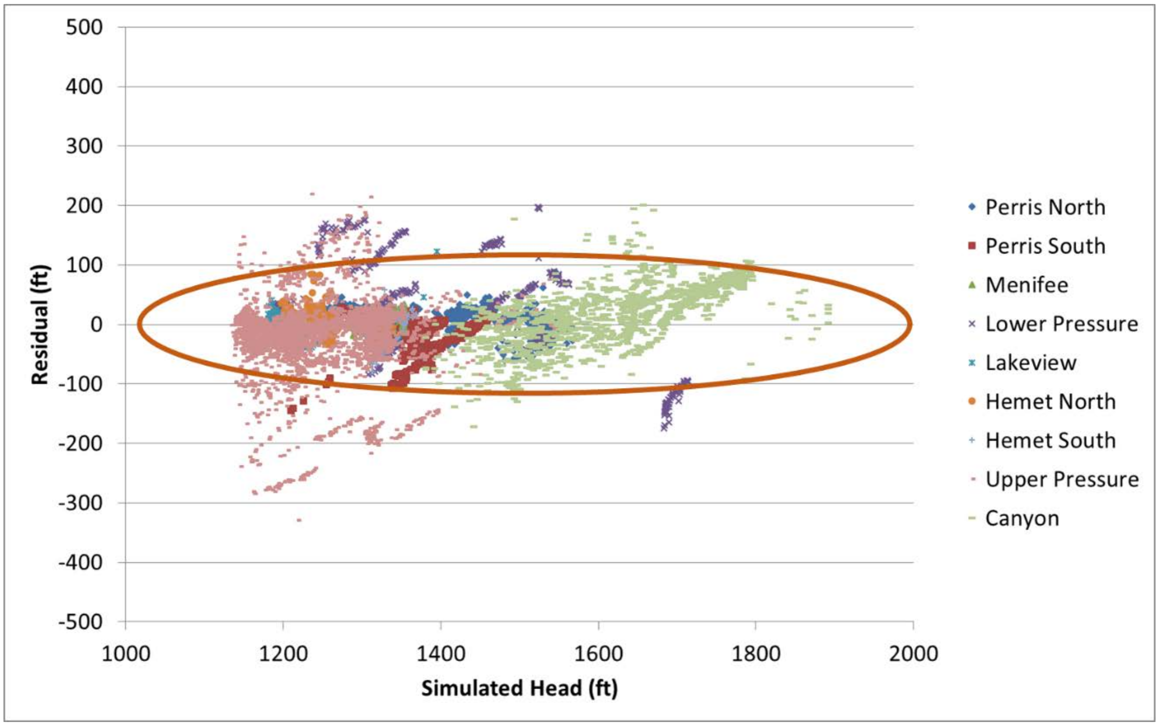


Figure 84: Residual vs. Simulated Values for the San Jacinto Groundwater Basin

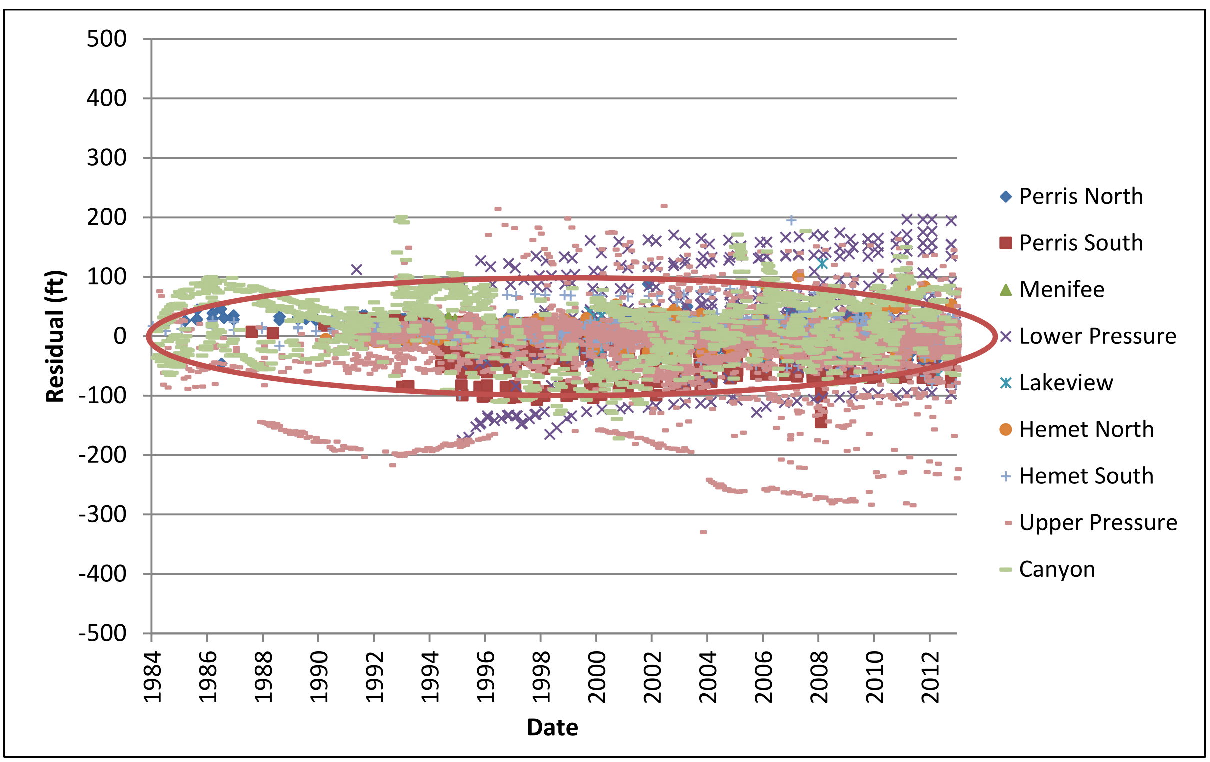


Figure 85: Residual Heads over Time for the San Jacinto Groundwater Basin

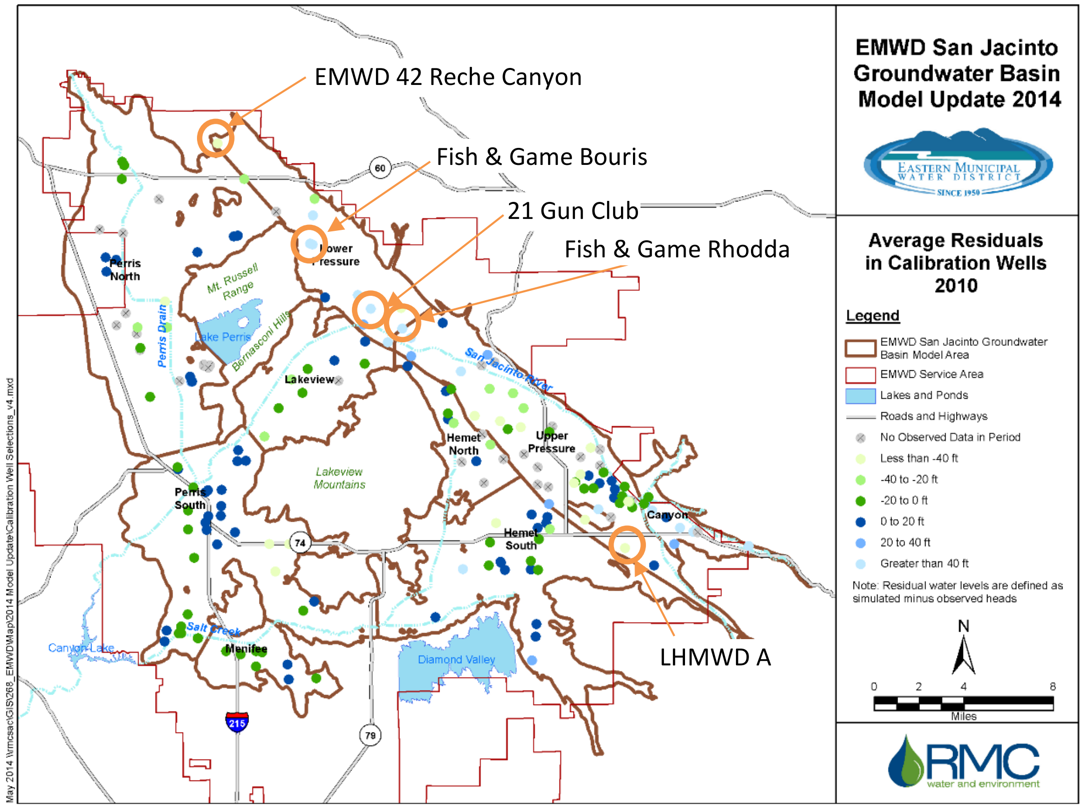


Figure 86: Location of Wells outside Expected Calibration Trends

4.5.4 *Groundwater Level Calibration and Hydrograph Trend Matching*

Final calibration groundwater levels resulted in a good match to observed groundwater trends for key areas and wells. Examples of the hydrographs of key wells and areas in the Basin can be seen in Figure 87 through Figure 91. The calculated residual (simulated minus observed) was plotted on the hydrographs for further analysis of the calibration. Although all active layers were plotted on the hydrographs, the layer where the majority of the well was screened is indicated in the bottom right corner. The residuals were based on this layer assignment. A complete set of the hydrographs for the calibration wells in the SJFM-2014 can be found in Appendix D.

In areas such as the Upper Pressure Intake area, clusters of wells within a small radius may have had varying groundwater levels that could not be captured by the regional SJFM-2014. Hydrograph trend matching is significant for these areas to illustrate that the regional trends of the area are being simulated, even if the individual groundwater levels are not exactly matched. The EMWD 28 Peacock Radaker well in Figure 90 demonstrates that the SJFM-2014 simulates these regional trends. In Canyon wells like EMWD Cienega 06 shown in Figure 91, the long-term trends of the observed water levels are simulated.

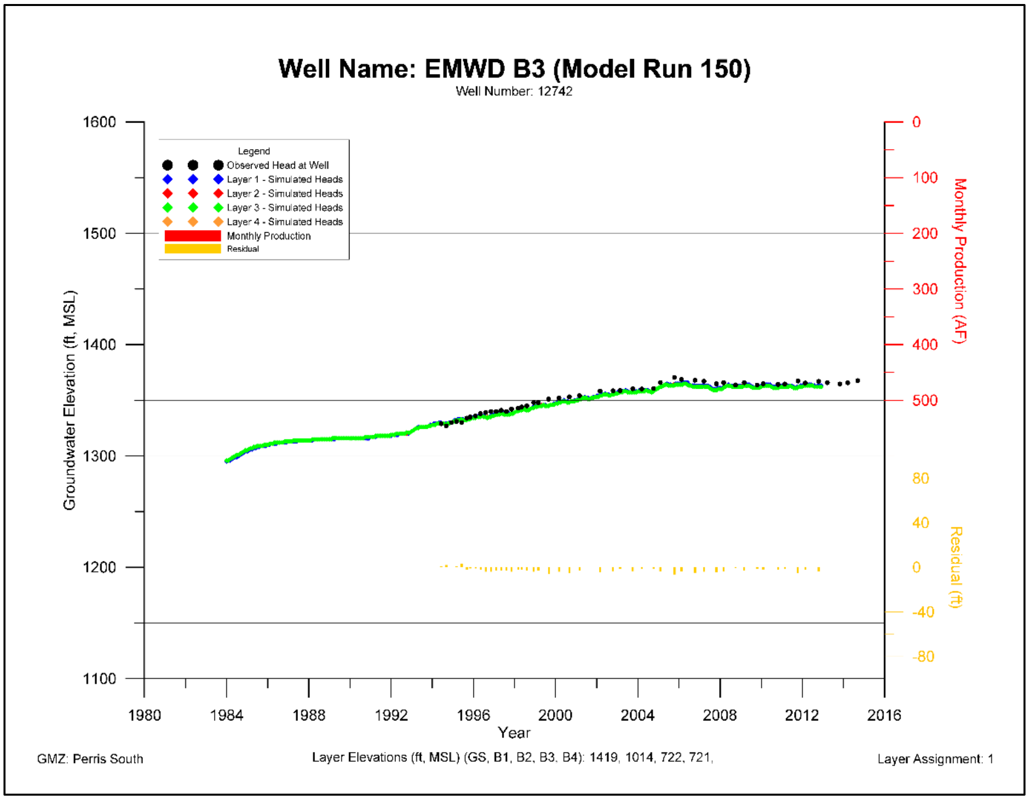


Figure 87: Calibration Hydrograph for well EMWD B3 in Perris South

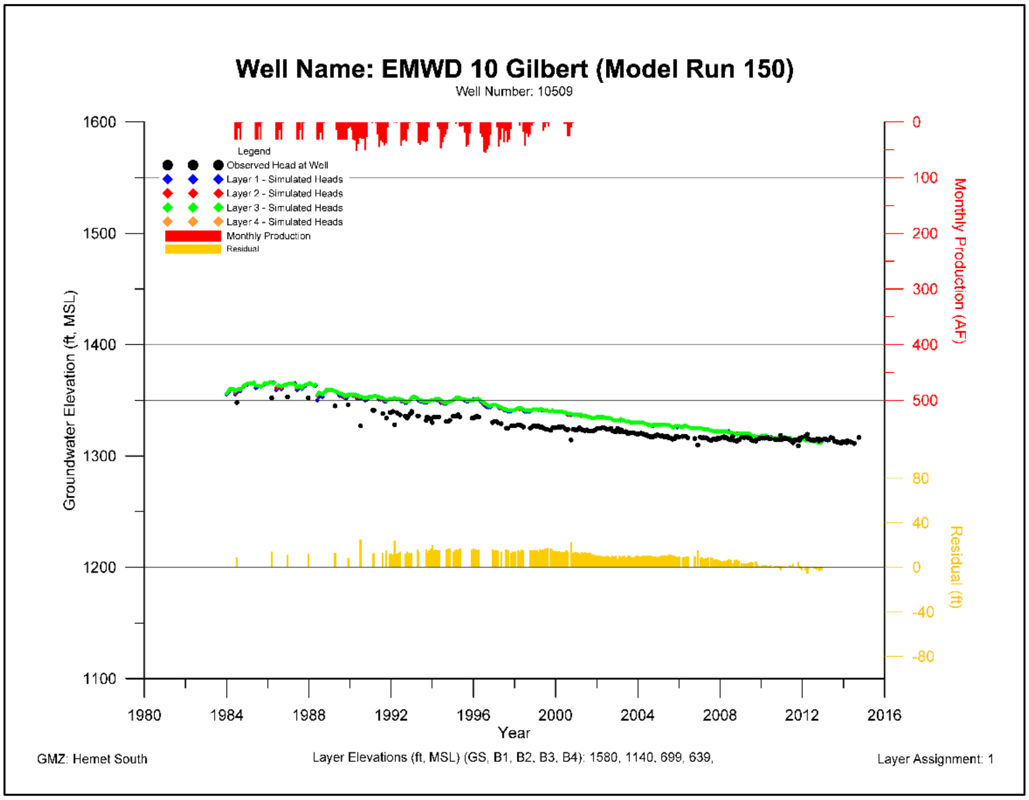


Figure 88: Calibration Hydrograph for well EMWD 10 Gilbert in Hemet South

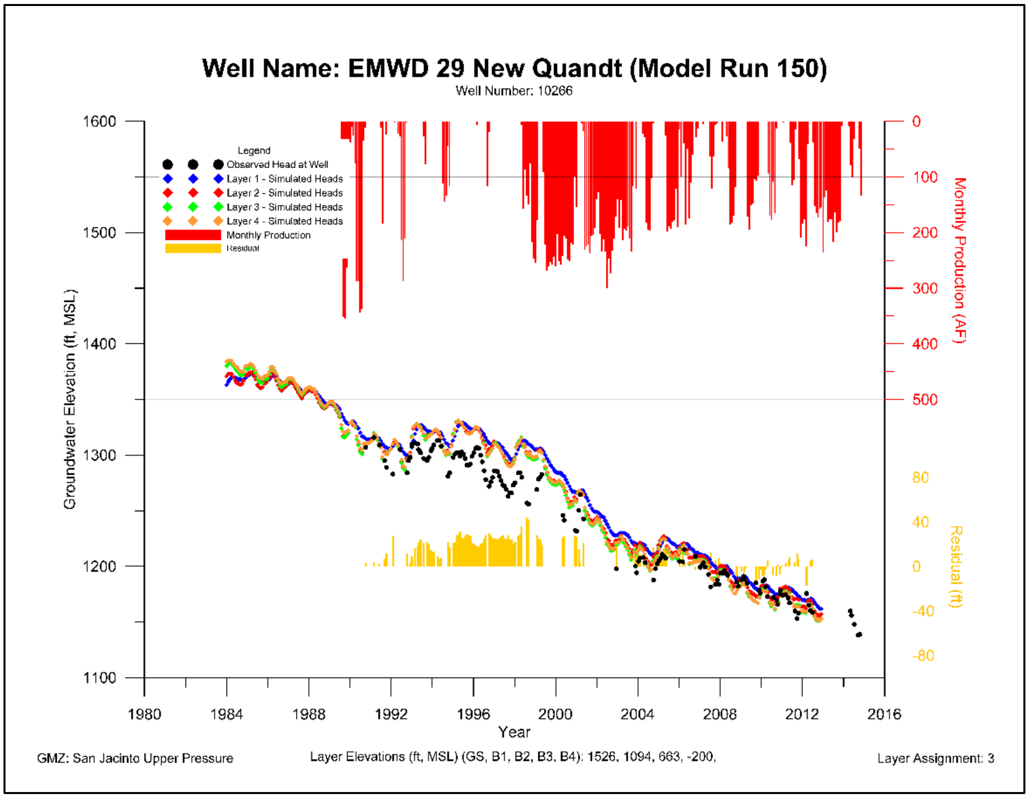


Figure 89: Calibration Hydrograph for EMWD 29 New Quandt in Upper Pressure

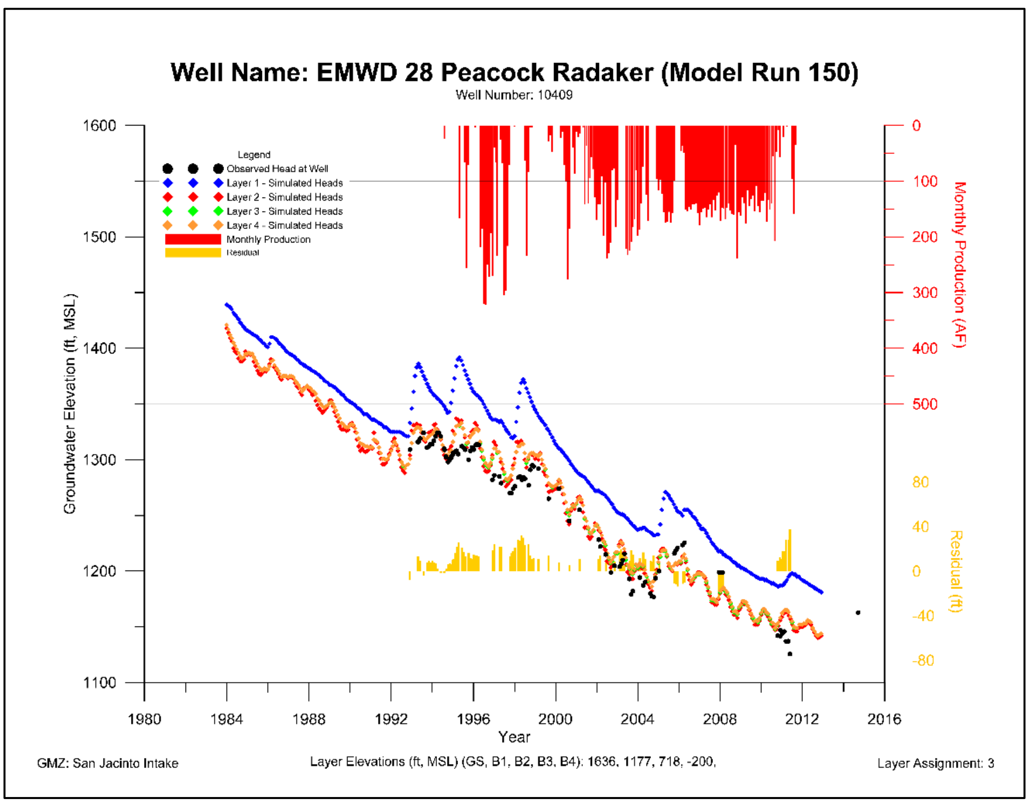


Figure 90: Calibration Hydrograph for EMWD 28 Peacock Radaker in Upper Pressure

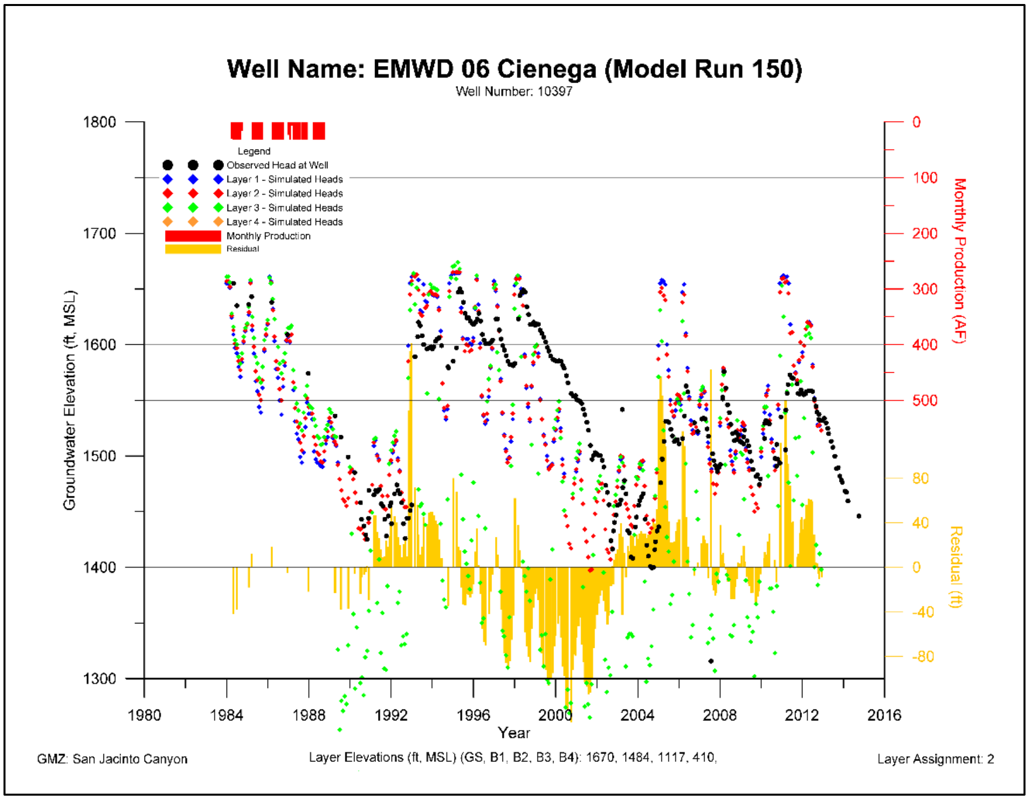


Figure 91: Calibration Hydrograph for EMWD 06 Cienega in Canyon

4.6 Sensitivity Analysis

Sensitivity analyses of the SJFM-2014 parameters were performed to quantify the sensitivity of the calibrated model to specific model parameters and boundary conditions. The sensitivity analyses were performed by running the model with four different values of the selected parameters and comparing results of the run to the base calibration run. Sensitivity analyses were performed across the entire Basin for the following parameters.

- Applied Water (including recharge ponds and reclaimed water facilities)
- Horizontal hydraulic conductivity
- Vertical hydraulic conductivity
- Specific yield
- Specific storage
- Mountain front recharge
- Streambed hydraulic conductivity

4.6.1 *Metrics of Sensitivity Analysis*

A sensitivity metric is a single number derived from the model results which has a unique value for each model run corresponding to a given set of data or parameter value. Two different metrics were selected to measure the sensitivity of the model. The sensitivity metrics used in the analysis are:

- Average groundwater elevation at calibration wells

- Average root mean square (RMS) error between observed and simulated groundwater elevations

To quantify the sensitivity of each parameter, model runs were performed after multiplying each sensitivity parameter by factors of 0.25, 0.5, 1.5 and 2.

Average groundwater elevations were obtained for all calibration wells in the entire Basin. The change between these elevations indicated the magnitude of sensitivity to a specific parameter. A greater change in average groundwater elevations (positive or negative) meant greater sensitivity.

The average groundwater head at all calibration wells in the basin over the entire simulation period can be mathematically expressed by:

$$\overline{H} = \frac{1}{M}\sum_{k=1}^{M} H_k$$

And, the average groundwater head at all calibration wells in the basin for a specific stress period is expressed by:

$$H_k = \frac{1}{N}\sum_{i=1}^{N}[\frac{1}{L}\sum_{j=1}^{L} h_j]_i^k$$

Where,

M total number of stress periods,

H_k average head in the basin at k-th stress period,

N number of calibration wells in the basin,

L number of model layers in aquifer,

h_j groundwater elevation at layer j, and

i, j, k indices for well, layer, and time, respectively.

The average RMS error at calibration wells in each basin is defined as the average of individual RMS error at each calibration well. Again, a higher number meant greater sensitivity to that parameter. Parameters with little to no impact on the model resulted in values around one.

The RMS error at a calibration well is defined as follows:

$$RMS_w = \sqrt{\left\{\frac{1}{N_o}\sum_{k=1}^{No}[h_{k,w}^{o} - h_{k,w}^{s}]^2\right\}}$$

Where,

N_0 Number of observations at well k,

$h_{k,w}^{o}$ Observed groundwater elevation at time step k, at well w,

$h_{k,w}^{s}$ Simulated groundwater elevation at time step k, at well w.

4.6.2 *Results of Sensitivity Analysis*

4.6.2.1 Applied Water Recharge

The results of the sensitivity analysis pertaining to applied water recharge is presented in Figure 92. Changes to applied water recharge had the largest effect on the SJFM-2014 of all of the sensitivity parameters. This can be attributed to the fact that it represented one of the largest inflows in the water budget. As expected, decreasing and increasing the applied water recharge decreased and increased the average groundwater levels throughout the Basin, respectively. Upper Pressure was the most sensitive to the changes in applied water recharge, which was expected since it has the largest area of all the GMZs. The greatest change occurred when doubling the amount of applied water input into the system. Figure 92 indicates that if the amount of applied water was doubled, the average groundwater elevation would increase by nearly 75 feet. In Upper Pressure, the average groundwater elevations would increase by over 100 feet.

In general, the RMS errors were greater than those used in the calibration run of the SJFM-2014. This indicated that the calibrated applied water recharge values resulted in the minimum RMS error for the calibration wells. In Lower Pressure and Canyon, the relative root mean squared error values lower than one implied that if lower applied water recharge were to be inputted into the model, it would result in a slightly lower error for those GMZs.

4.6.2.2 Horizontal Hydraulic Conductivity

The sensitivity of the SJFM-2014 to changes in horizontal hydraulic conductivity is presented in Figure 93. Use of K_h values lower than the calibrated model results in higher simulated groundwater levels in three GMZs, while the remaining GMZs experience reduced groundwater levels. Lower K_h values caused water levels to rise in areas where water initially was flowing out of the area, but became backed up due to the lower conductivity. In areas where the low K_h values caused lower water levels, the low conductivities from upstream areas did not allow water to flow freely where they had initially, decreasing groundwater flow and water levels alike.

Lower Pressure, Lakeview and Upper Pressure GMZs are most impacted by the changes of horizontal hydraulic conductivity.

4.6.2.3 Vertical Hydraulic Conductivity

The SJFM-2014 shows very little sensitivity to changes in vertical hydraulic conductivity, as shown by the minor deviations in Figure 94. This implies that changes to vertical hydraulic conductivity needed to be unrealistically large in order to have an impact on the simulated water levels. This is a result of the general vertical homogeneity found within the Basin, allowing groundwater to travel easily between layers.

4.6.2.4 Specific Storage

Similar to vertical hydraulic conductivity, changes in specific storage had very little impact on the SJFM-2014 (Figure 95). Upper Pressure exhibited some sensitivity to changes in the specific storage, but the sensitivity is low relative to other aquifer parameters.

4.6.2.5 Specific Yield

Specific yield was one of the more sensitive parameters in the SJFM-2014 (Figure 96). Specific yield represents the amount of groundwater the aquifer would release when water levels drop. Much like horizontal hydraulic conductivity, the effect on average groundwater elevations due to change in specific yield varied by GMZ (Figure 96). Some GMZs, such as Perris North and Perris South exhibited a negative slope, indicating that groundwater levels decreased as the specific yield increased. Other GMZs like Canyon and Upper Pressure followed a positive slope. Perris North and Perris South were most sensitive to changes in specific yield.

4.6.2.6 Mountain Front Recharge

Only a few GMZs, particularly Lower and Upper Pressure, were highly sensitive to changes in mountain front recharge (Figure 97). This is in part due to the fact that the highest inflows from mountain front recharge were found along the boundaries of Lower Pressure and Upper Pressure.

4.6.2.7 Streambed Hydraulic Conductivity

The sensitivity of the SJFM-2014 to changes in streambed hydraulic conductivity is presented in Figure 98. Very few GMZs received significant recharge from streamflow outside of Canyon and Upper Pressure. Upper Pressure showed more sensitivity to changes in streambed hydraulic conductivity. Lower streambed hydraulic conductivities resulted in less stream recharge and lower groundwater levels. In contrast

4.6.2.8 Impact Areas

The sensitivity of the SJFM-2014 to changes in parameters varied by GMZ. In general, the model was most sensitive to changes in applied water recharge, horizontal hydraulic conductivity and specific yield. The SJFM-2014 was least sensitive to vertical hydraulic conductivity, specific storage, and riverbed hydraulic conductivity changes. When the SJFM-2014 was sensitive to a specific parameter, typically Upper Pressure and Lower Pressure were the most impacted GMZs.

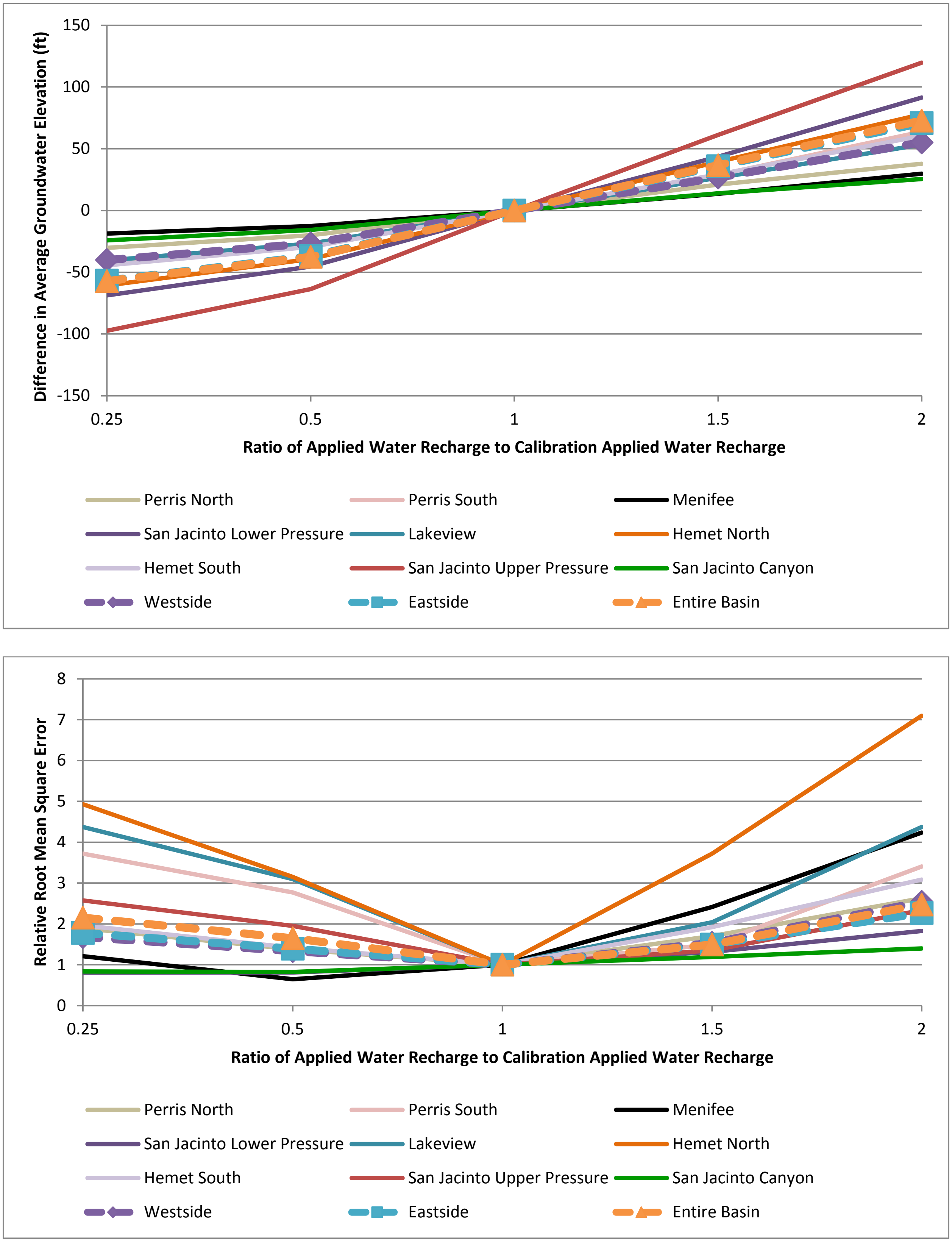


Figure 92: Sensitivity to Applied Water

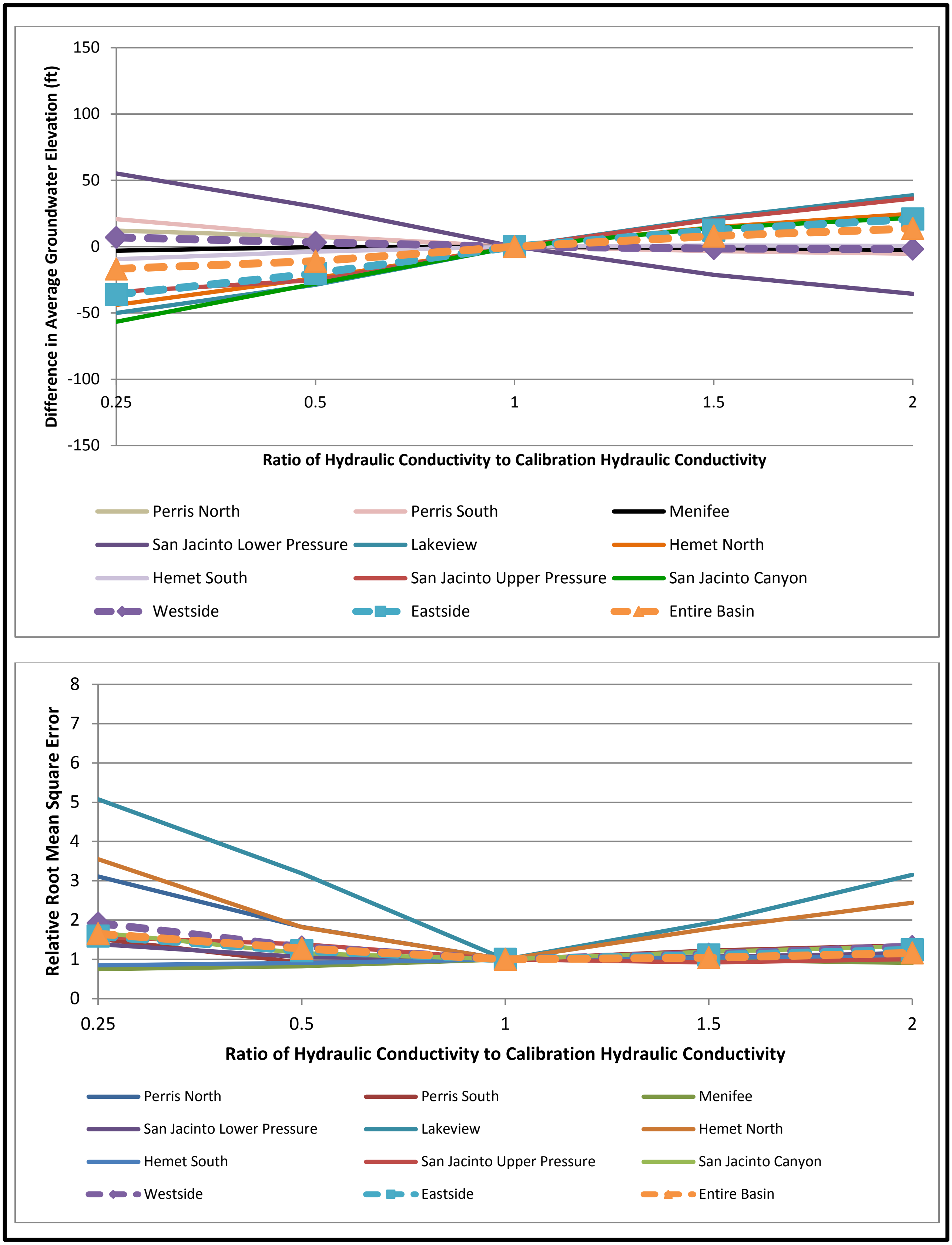
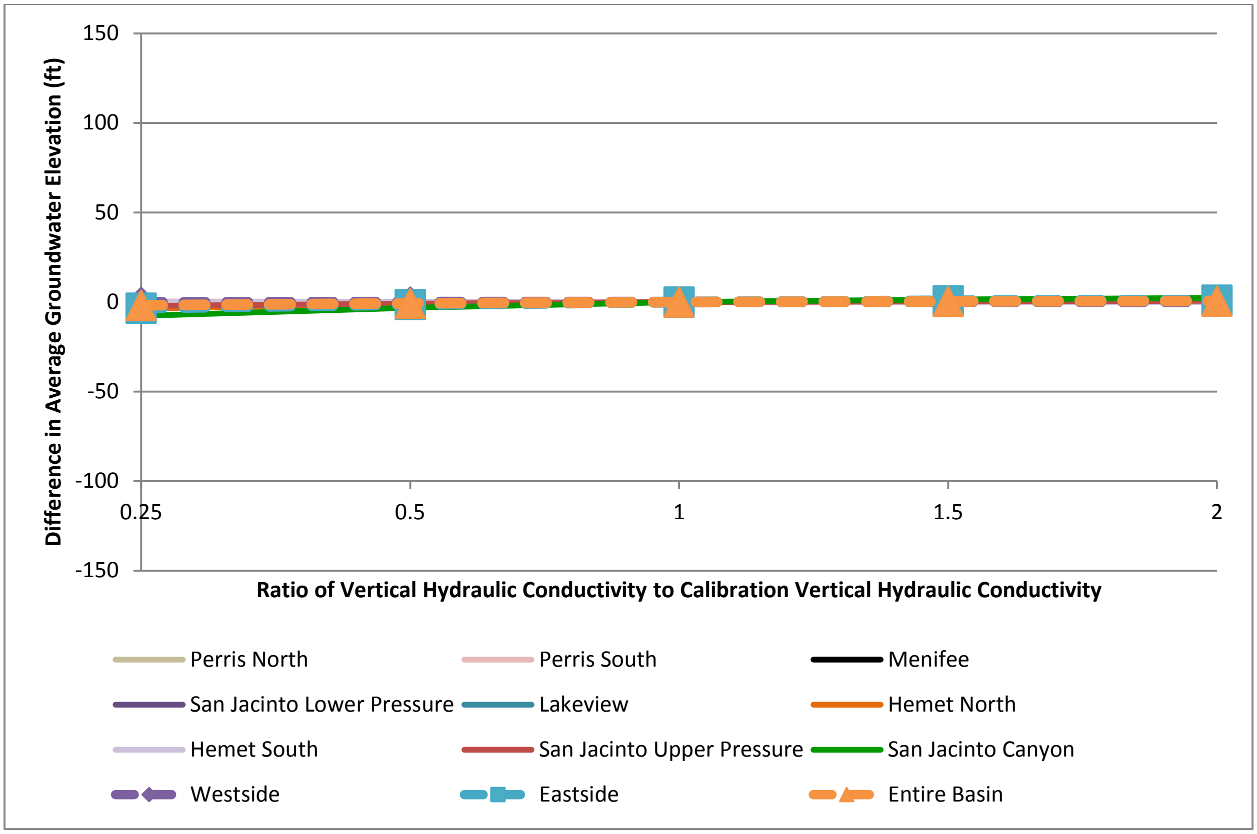


Figure 93: Sensitivity to Horizontal Hydraulic Conductivity



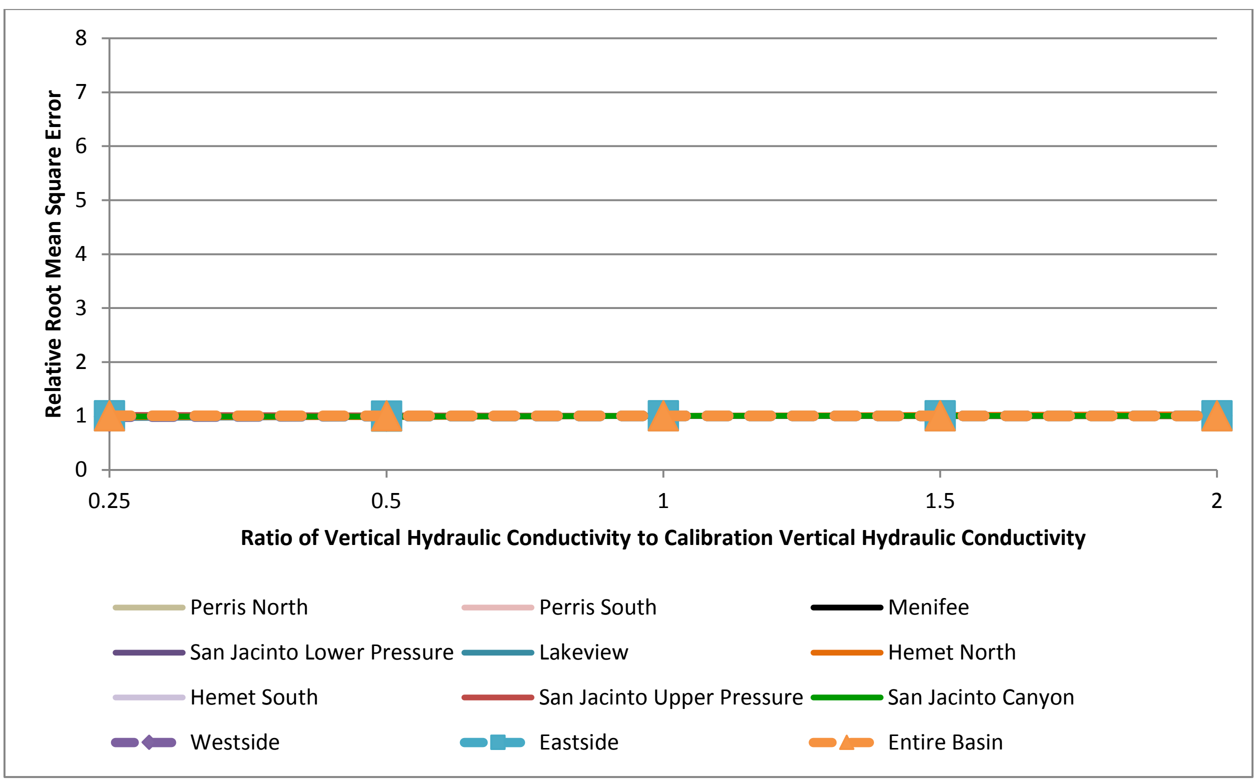


Figure 94: Sensitivity to Vertical Hydraulic Conductivity

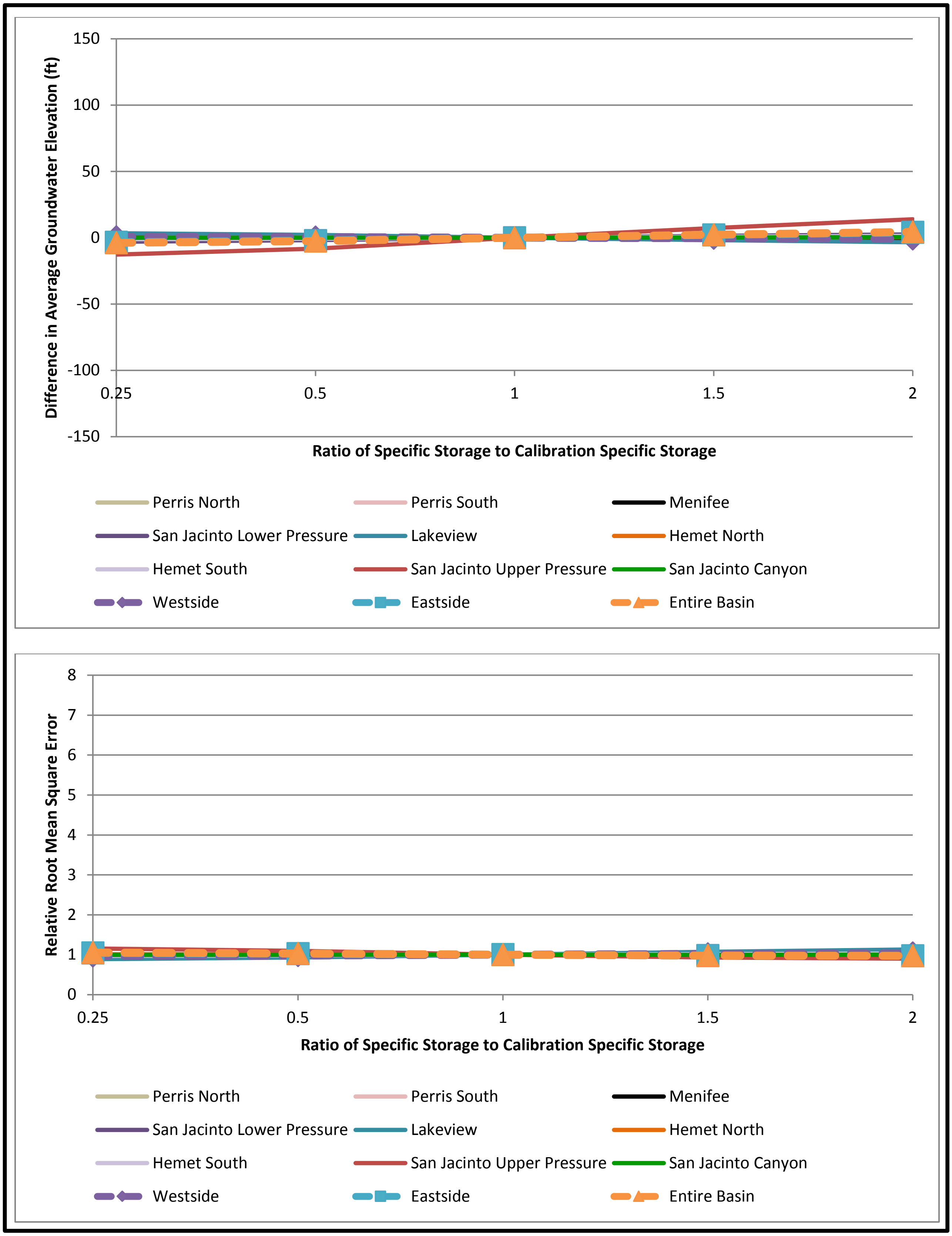
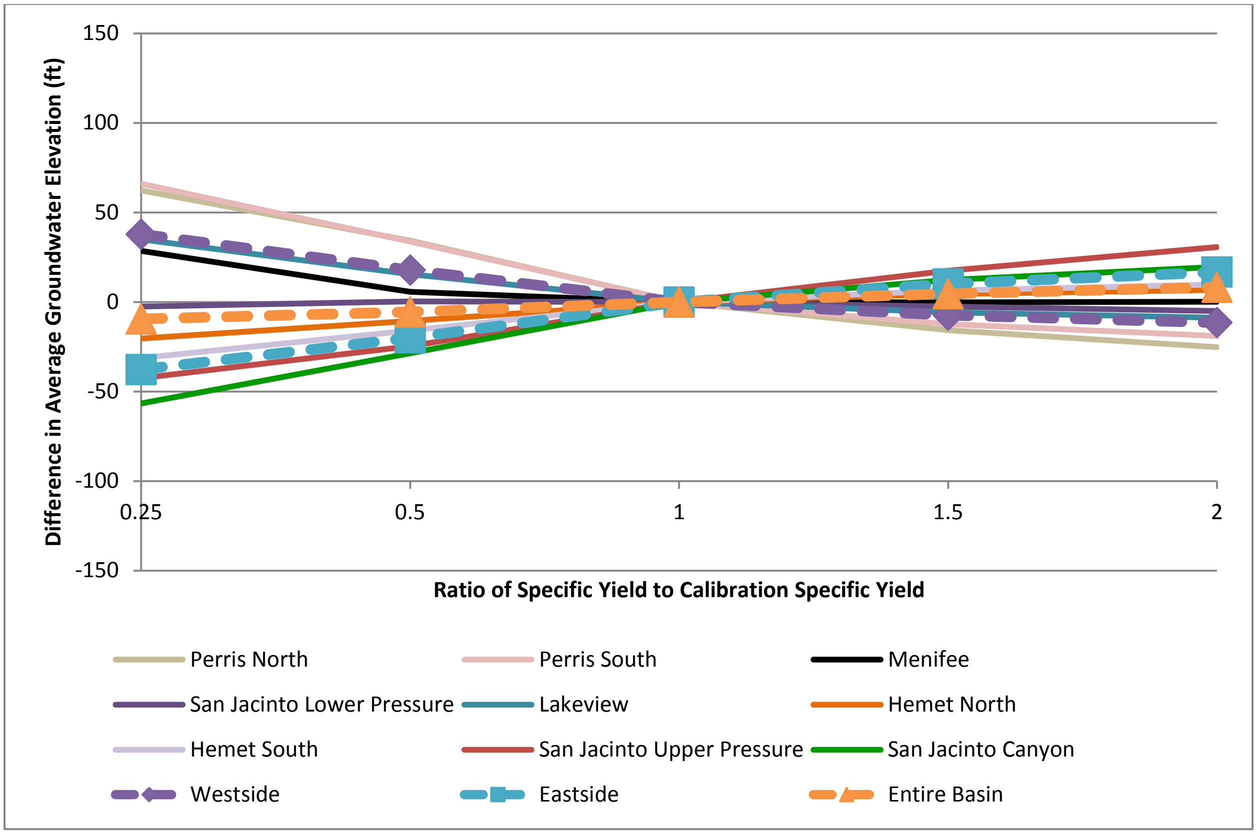


Figure 95: Sensitivity to Specific Storage



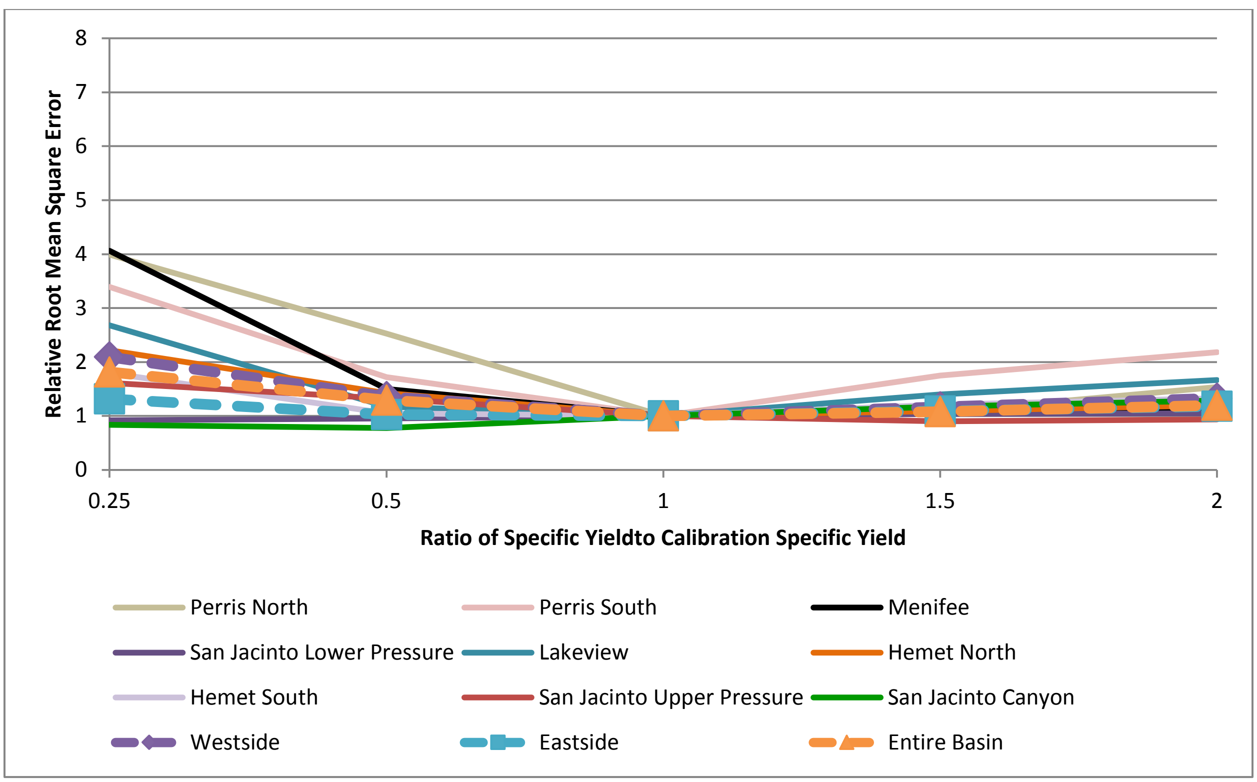


Figure 96: Sensitivity to Specific Yield

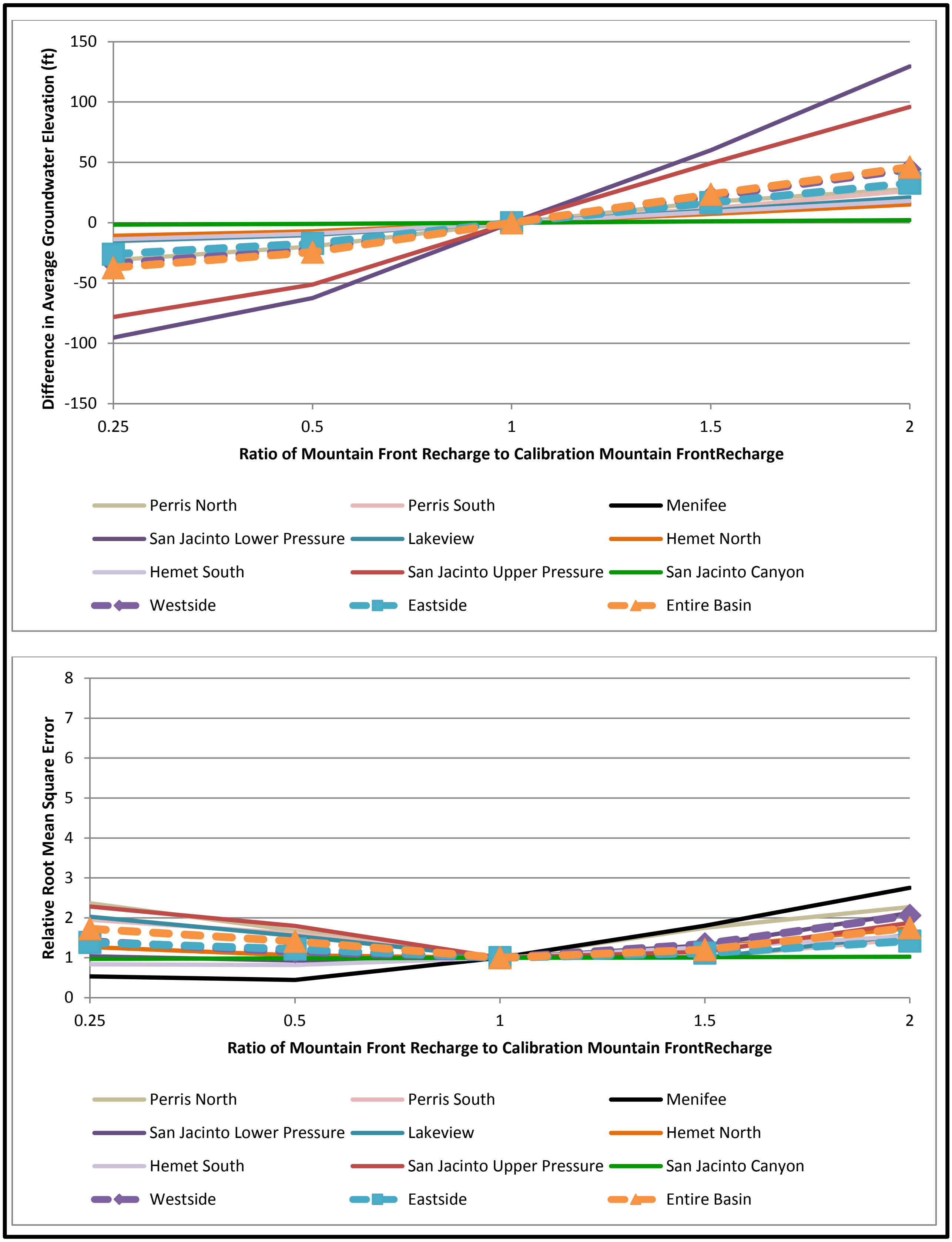


Figure 97: Sensitivity to Mountain Front Recharge

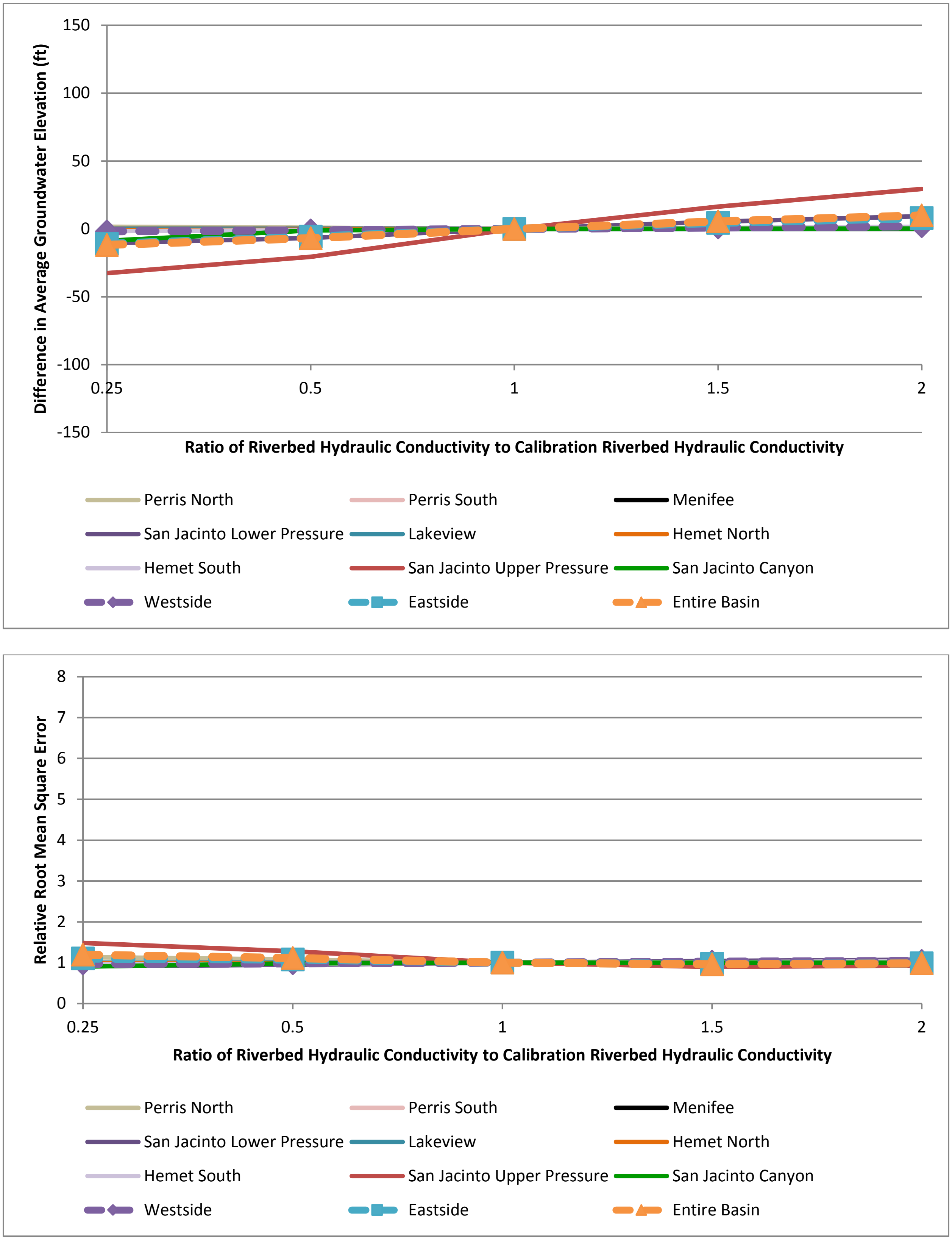


Figure 98: Sensitivity to Riverbed Hydraulic Conductivity

Section 5 Groundwater Model Predictive (Future) Scenario Application

The calibrated SJFM-2014 Model was used for simulating the future conditions under various assumptions and conditions and as a comparative tool to determine the effects of various projects and alternatives. Five different scenarios were evaluated:

- Baseline Scenario
- Scenario A: Optimize West San Jacinto Production
- Scenario B: Drought without Water Banking
- Scenario C: Drought with Constant Recharge from Water Banking
- Scenario D: Build Out with Water Banking and 10-Year Hydrologic Cycles

5.1 Baseline Scenario Development and Assumptions

The Baseline Scenario propagated current conditions into the future to use as a comparison with the SJFM-2014 as well as a basis for Scenario A through Scenario C. The scenario had a simulation period of 29 years (2013-2041), similar to the calibration period of the SJFM-2014. For the Baseline Scenario, aquifer parameters such as hydraulic conductivity, specific yield and specific storage did not change from the calibration model to the Baseline Scenario.

Using future growth and water use projections provided by EMWD, modifications were made to model components for simulation of future conditions. The model components were grouped into three categories: General, Applied Water and Production, as shown in Table 26.

Table 26: Baseline Model Components

General	Applied Water	Production
Hydrologic Period	Rainfall	Groundwater Production
Streamflows	Rain Aerial Recharge	H/San Jacinto Production
Initial Conditions	Retail Sales	West San Jacinto Production
Boundary Conditions	Reclaimed Water Sales	Private Producers
Mountain Front Recharge	Reclaimed Water Facilities	New Wells
Land Use	Irrigation Applied Water	
	Artificial Recharge	

5.1.1 *Model Components*

The following section discusses the changes made to the model components from the SJFM-2014 Model to achieve the Baseline Model conditions.

5.1.1.1 General Components

Hydrologic Period

The hydrologic period of the Baseline Scenario was 29 years spanning from 2013-2041. Each future simulation year had a matching historical hydrology. Years 2013-2015 experiencing a drought were simulated with historical dry year data from 1999. The Baseline Scenario years and the matching historical hydrology can be found in Table 27.

Table 27: Baseline Hydrologic Period and Matching Historical Hydrology

Baseline Simulation Year	1	2	3	4	5	6	7	8	9	10
Model Calendar Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Matching Hydrology Year	1999	1999	1999	2000	2001	2002	2003	2004	2005	2006
Observed Rainfall (in/yr)	6.8	6.8	6.8	8.4	9.0	5.5	12.9	14.1	17.4	9.0
Baseline Simulation Year	11	12	13	14	15	16	17	18	19	20
Model Calendar Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Matching Hydrology Year	2007	2008	2009	2010	2011	2012	1984	1985	1986	1987
Observed Rainfall (in/yr)	6.6	11.4	7.4	19.5	9.6	7.5	8.7	9.6	12.7	13.1
Baseline Simulation Year	21	22	23	24	25	26	27	28	29	
Model Calendar Year	2033	2034	2035	2036	2037	2038	2039	2040	2041	
Matching Hydrology Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Observed Rainfall (in/yr)	8.6	5.1	9.2	16.2	20.6	25.6	10.6	20.6	12.8	

Streamflows

Streamflows were based on historical records and were applied to the Baseline Scenario using the matching hydrology years and corresponding streamflows. The selected streamflows were applied to the SFR package of MODFLOW in GMS.

Initial Conditions

The groundwater heads at the end of the December 2012 time step from the SJFM-2014 were used to build the initial water level conditions for the Baseline Scenario. This ensured consistent conditions and a smooth transition and between the two models.

Boundary Conditions

Boundary conditions, including seepage from Perris Lake and Diamond Valley Lake, were based on the historical estimates used for the SJFM-2014. These were applied to the model following the Baseline hydrologic period.

Mountain Front Recharge

Mountain front recharge was estimated in the SJFM-2014 as a function of monthly rainfall. As a result, the historic mountain front recharge was re-sorted and applied using the matching hydrologic period and the corresponding mountain front recharge rates.

Land Use

EMWD provided projected land use changes, including expected new service areas for EMWD. The changes were based on the Database of Proposed Projects (DOPP). The DOPP data provided projected equivalent dwelling units (EDU) associated with the years: 2016, 2018, 2022, 2025, 2030, 2035, 2040, 2045, and the ultimate buildout EDUs. The ultimate buildout EDU represented the total projected development for the given service area. For the Baseline Scenario, only a subset of these years were used to represent the model land use at a given time. This information is presented in Table 28.

Table 28: Baseline Land Use Periods

Simulation Period	Land Use Year
2013-2014	2010
2015-2019	2016
2020-2024	2020
2025-2029	2025
2030-2034	2030
2035-2039	2035
2040-2041	2040

The EDUs were used in determining the transition from one land use type to another and establish the corresponding pervious factor associated with the land use for each year. For years where EDUs had not yet reached the ultimate EDU buildout value, a transition percentage was assigned to the land use for that year. Subsequently, a corresponding transition pervious factor was also assigned for that year. It should be noted that if the projected land use changes from the 2010 land use but there were no EDU values in the DOPP between 2010 and 2041, the land use for the grid cell remained the same as the 2010 value. The ultimate land use (2040 conditions) for the Baseline Scenario is shown in Figure 99.

The transition pervious factor was calculated by multiplying the change in 2010 to the projected pervious factors by the transition percentage. The resultant was subtracted from the 2010 pervious factor to get the transition pervious factor for that year. For example, if a given year had projected only 40 EDUs of 100 ultimate EDUs, a transition percentage would be 40%. If the land use was transitioning from vacant (pervious factor of 0.98) to residential (pervious factor of 0.45), the transition pervious factor would be calculated as follows: 0.98 - (0.98-0.45)*40% = 0.768. The transition pervious factor for that given year would be 0.768. As the transition percentage changed, the corresponding pervious factor changed as well.

In some instances, the DOPP areas designated for residential and commercial land uses overlapped. In these cases, it was assumed the area was split equally between residential and commercial use and an average pervious factor was applied. Table 29 shows the land use pervious factors for the Baseline Scenario. These do not include any transition pervious factors.

Table 29: Baseline Scenario Land Use Pervious Factors

Land Use Type	Pervious Factor
Agriculture	0.96
Commercial	0.30
Residential	0.45
Residential/Commercial	0.375
Vacant	0.98

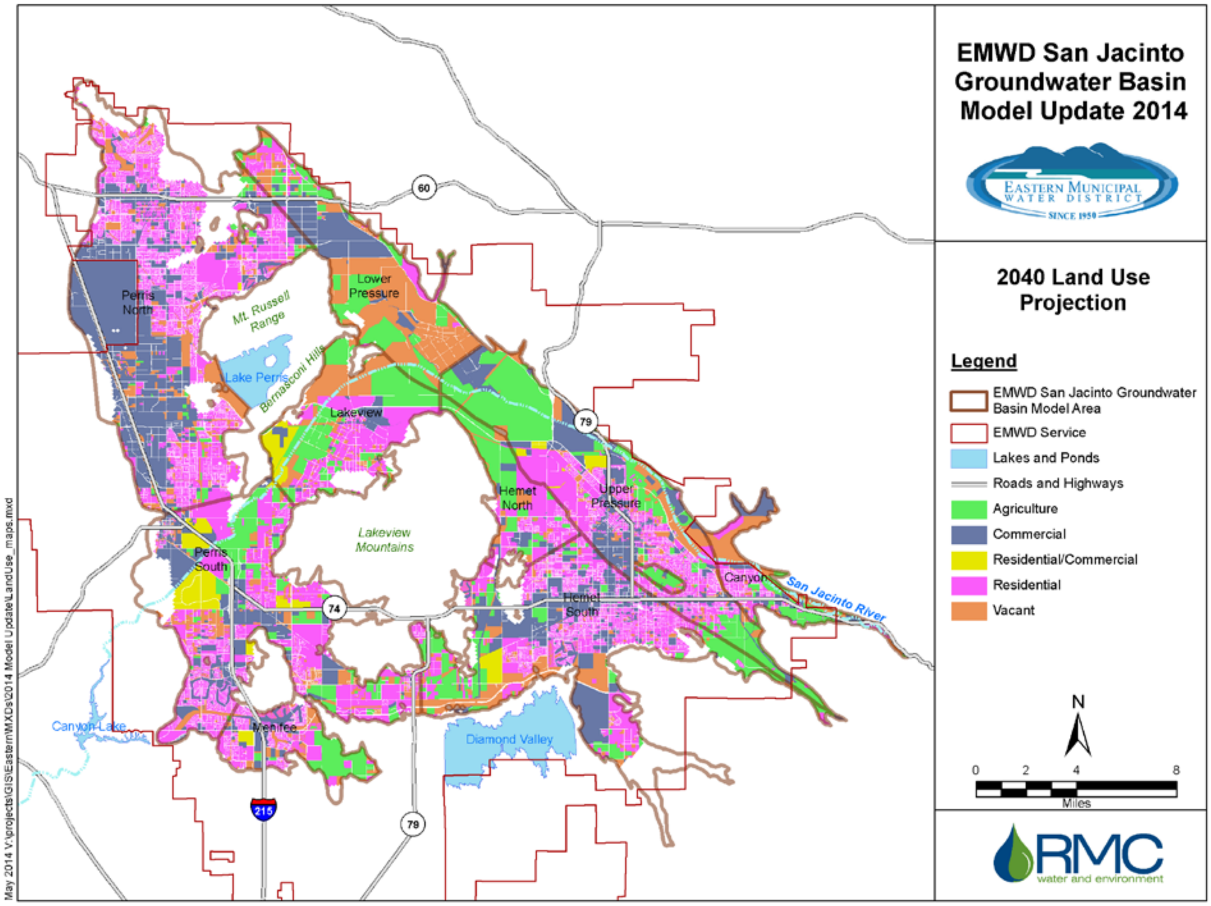


Figure 99: Baseline Ultimate Buildout Land Use

5.1.1.2 Applied Water Components

Rainfall

Rainfall data was based on historical records and were applied to the model to correspond with the Baseline hydrologic period (Table 27).

Rainfall Aerial Recharge

Aerial recharge from rainfall in the model was based on the estimated percolation parameters calculated from land use and soil type.

Retail Sales

EMWD and Subagency projected water sales were provided by EMWD. The EMWD sales projections originated from the EMWD Master Plan and were divided by Master Plan Economic Survey Area, shown in Figure 100. The Master Plan had three different projection levels: high, medium and low. The medium projection level were used for the EMWD water sales estimates. It was assumed that there would be a 10 percent conveyance loss to EMWD and Subagency customers and only 50 percent of these sales would be applied for outdoor use. As a result, 45 percent of the EMWD and Subagency projected water sales are available for recharge.

Neither the EMWD nor the Subagency projections were presented by specific customer areas or GIS shapefiles. In order to distribute the projected water sales to the individual customer shapefiles, it was assumed that the sales distribution was similar to that of the average sales distribution from 2011-2012. In the event that the Subagencies pump greater than their projected water demands, this water was assumed to be sold back to EMWD and added to the total EMWD sales.

For 2013-2014, historical data is used for EMWD Sales, but similar information was not available for Subagency sales. The projected 2015 sales data was used for the 2013-2014 for Subagency sales data. The Nuevo Water Company projections included the 2014 pumping data from the NWC Archibek well in addition to the projected sales.

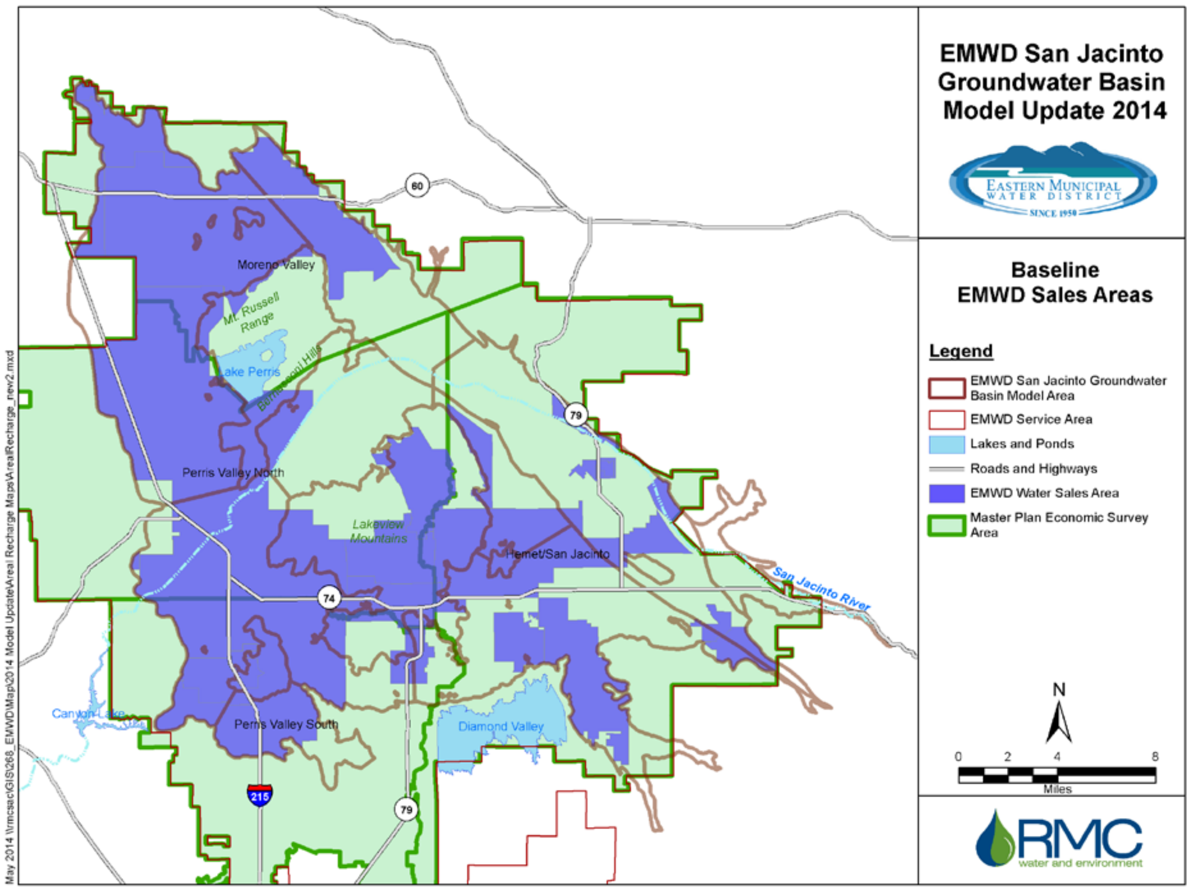


Figure 100: Baseline EMWD Sales Area and Master Plan Economic Survey Area

Reclaimed Water Sales

Reclaimed water sales were provided to the same locations as those in year 2012 in the SJFM-2014 with the addition of the Duck Ponds, which did not receive sales during 2012, but were expected to in the future. Reclaimed water sales were based on projections provided by EMWD from the Master Plan and were divided by Master Plan Sewer Service areas, as shown in Figure 101. The Master Plan had three different projection levels: high, medium and low. The medium projection level was used for the reclaimed water sales estimates. Projected data for the Sun City and Perris sewer service areas were presented as a combined total. These projections were distributed to each sewer area relative to the area of each service polygon.

Similar to EMWD water sales, the reclaimed water sales projections were presented by sewer service area rather than specific customer areas or GIS shapefiles. To distribute the projected reclaimed water sales to the individual customer shapefiles, it was assumed that the sales distribution was similar to that of the average sales distribution from 2011-2012. Since the Duck Ponds received no sales during 2011-2012, average distribution to the Duck Ponds was based on 2009-2010 data.

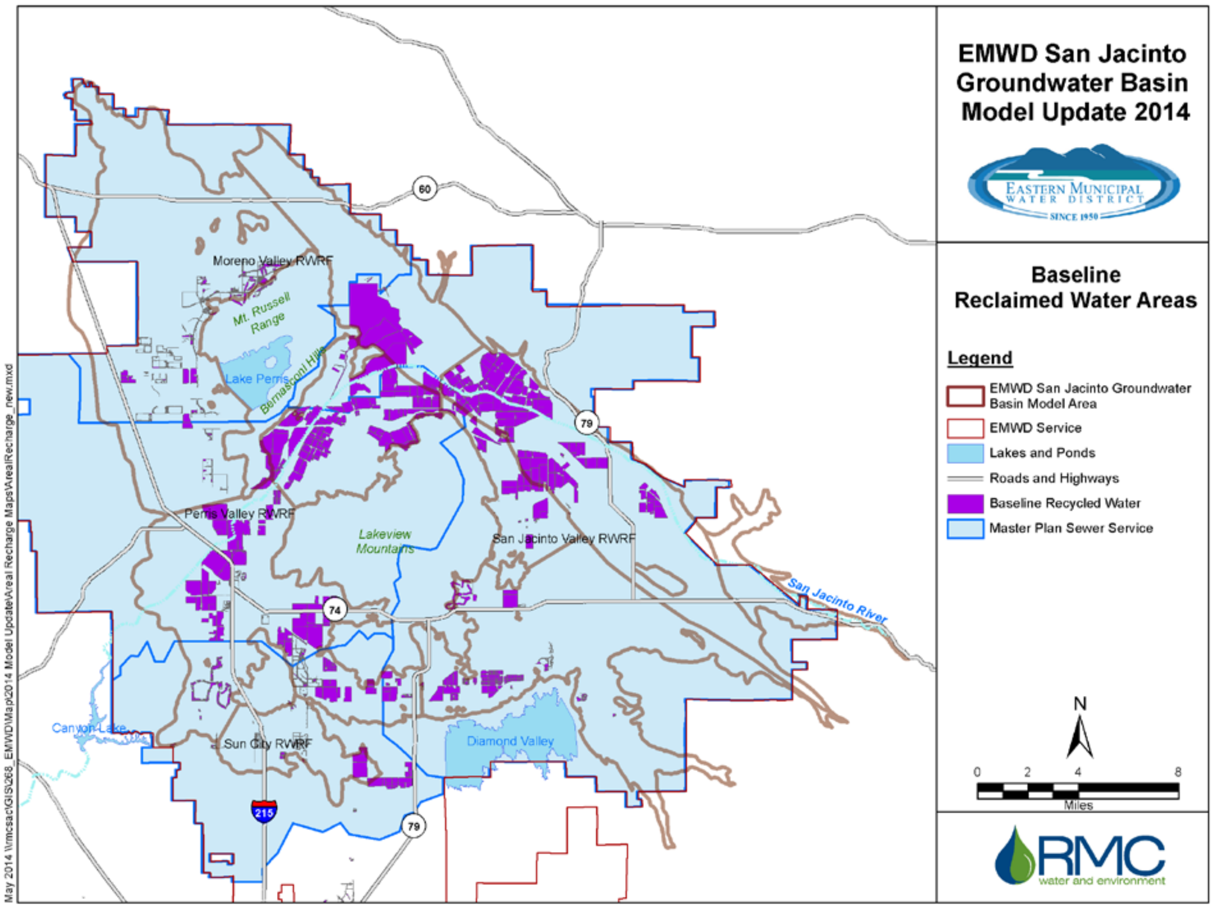


Figure 101: Baseline Reclaimed Water and Master Plan Sewer Service Areas

Irrigation Applied Water

It was assumed that private pumping and irrigation applied water remained constant at historical 2013 levels, as this represented the most complete and recent dataset. These rates were applied every year for the entire Baseline Scenario simulation period.

Reclaimed Water Facilities

The Baseline Scenario used all reclaimed water facilities active in 2012 in the SJFM-2014. The 2012 incidental recharge rates were applied to these facilities through all simulation years. The only future reclaimed water facilities planned to be built are the Trumble Ponds 2 and 3. In 2018 and 2020, the

Trumble 2 and Trumble 3 Ponds became active, respectively. These ponds had similar incidental recharge rates as the Trumble 1 Pond.

In 2017, the Case Road pond was deepened, causing the expected percolation rate to be increased by 50 percent.

Artificial Recharge

Similar to reclaimed water facilities, the Baseline Scenario used all point recharge facilities that were active in 2012 in the SJFM-2014. These facilities used the same operating schedule as used in the SJFM-2014. The Integrated Recharge and Recovery Program (IRRP) ponds replaced the Conjunctive Use Ponds that were active in the SJFM-2014. The IRRP ponds were active from March to September. Soboba Pit and the Grant Avenue Ponds received historic recharge rates based on the hydrologic period.

The Soboba Settlement Agreement required delivery of 7,500 AFY by Metropolitan Water District (MWD) that was recharged at the IRRP ponds. The IRRP ponds received settlement water starting in 2016. Historical recharge data was used for 2013-2014, while it was assumed that no recharge was applied in 2015 due to the drought. The IRRP ponds were online six months out of the year.

5.1.1.3 Groundwater Production Components

Municipal Groundwater Production

Groundwater production was based on current and under-construction facilities. EMWD provided annual Adjusted Base Production Right (ABPR) rates for the municipal production wells. To distribute the annual projections to monthly production rates, historical trends for each well ere applied to the annual projections. Several new wells and replacement wells were added in the Baseline Scenario. Most of the wells became active after 2018. Since these wells did not have historical pumping trends, trends of nearby wells were used, as shown in Table 30. Locations of these wells are provided in Figure 102. Replacement wells used the trends of the wells being replaced.

Table 30: New Wells in Baseline Model and Corresponding Monthly Trends

New Well	Existing Well Monthly Trend
EMWD 37 River	EMWD 14
EMWD 38 Mountain/Meridian Channel	EMWD 28
EMWD 64 Hemlock/Davis EMWD 65 Ironwood Heacock EMWD 66 Ironwood/Davis	EMWD 44
EMWD 93, 94, 95, 96	EMWD 87
LHMWD 16	LHMWD 14
North Perris GW Development Well	EMWD 56
EMWD 80 Seventh	EMWD 80R
LHMWD E	LHMWD E2

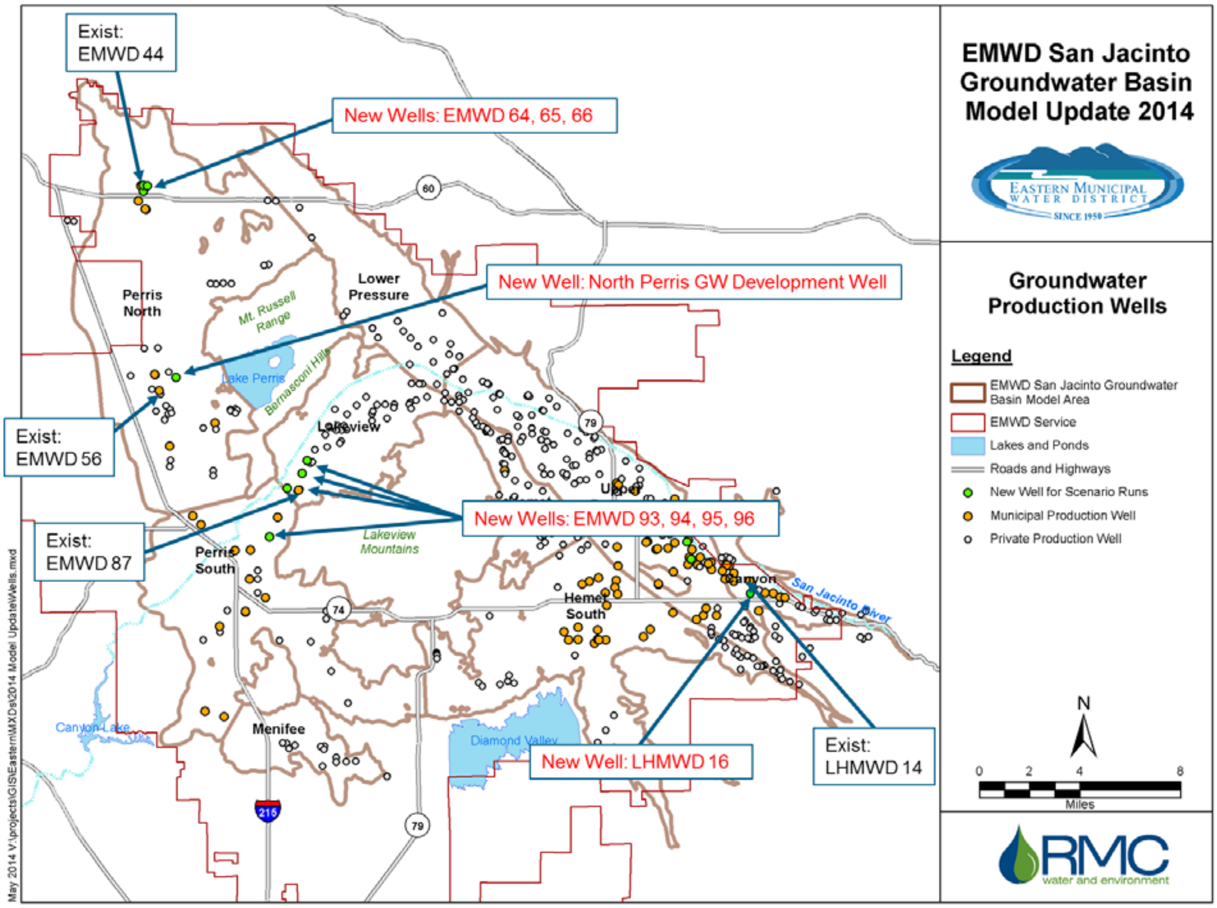


Figure 102: New Production Wells for Scenario Runs and Existing Wells used for Monthly Trends

The Soboba projected production was based on Exhibit I of the Settlement Agreement. This is discussed in further detail in the following section.

Hemet-San Jacinto (HSJ) Management Area Production

Production in the HSJ Management Area was based on their ABPR, as provided by EMWD and discussed in the Municipal Groundwater Production section above. It was assumed that EMWD will deplete its banked water supply by 2019 and will begin pumping at its ABPR starting in 2020.

The Soboba production was based on Exhibit I of the Settlement Agreement, but these rates were not implemented until 2016. Historical pumping rates provided by EMWD were used for 2013-2014 and an estimated rate of 1,500 AF was used for 2015. The annual Soboba pumping rates are presented in Table 31. Since these rates were provided as a lump sum, the production was distributed amongst wells based on the average percent of total pumping during 2012-2014.

Table 31: Soboba Well Baseline Production Rates

Year	Maximum Soboba Pumping Rate
2013-2014	Historical
2015	1,500 AF
2016-2017	2,900 AF (per Exhibit I)
2018-2022	3,215 AF (per Exhibit I)
2023-2027	3,520 AF (per Exhibit I)
2028-2032	3,825 AF (per Exhibit I)
2033-2037	4,010 AF (per Exhibit I)
2038-2041	4,020 AF (per Exhibit I)

West San Jacinto (WSJ) Management Area Production

Projected municipal production in the WSJ Management Area was provided by EMWD. Several new wells were added to the Baseline Scenario in the WSJ Management Area, specifically in Moreno Valley, Perris North and brackish groundwater well expansion in Perris South and Lakeview. Near Lake Perris, EMWD and the City of Perris increased production rates to approximately 3,200 AFY. The City of Perris wells produced 2,000 AFY on average, distributed amongst the four wells based on average 2013-2014 production rates. For Nuevo Water Company, only one well was active in the Baseline Scenario, pumping approximately 900 AFY each year in the Baseline Scenario.

Private Producers

Historical private production data was used for 2013-2014, as provided by EMWD. For simulation years 2015-2041, the 2014 historical production data was used. Any private producers not active during 2014 were assumed to be inactive during the entirety of the Baseline Scenario.

5.1.2 *Baseline Water Budget Results*

The water budgets of the Baseline are presented by the entire Basin, Hemet-San Jacinto Management Area and West San Jacinto Management area in Figure 103 through Figure 105, respectively. The Baseline results reflected the changes made to model input data. In the Basin, cumulative storage started to stabilize under Baseline conditions, with the exception of the last few years when storage increased due to above average rainfall, streamflows, and the combination of increased applied water rates with stabilized production. The West San Jacinto Management Area exhibits stabilized cumulative change in storage. These stabilized cumulative change in storage values were expected for the overall groundwater basin under Baseline conditions due to the implementation of basin management plans and basin adjudication (Hemet – San Jacinto Management Area) developed to minimize overdraft conditions and promote sustainable groundwater use prior to the scenario start date. The baseline scenario was to be used as basis of comparison for the other model scenarios.

The Hemet-San Jacinto Management Area started to stabilize around 2020, once all new wells were added and production became constant. The storage values spiked at the end of the Baseline study period due to the above average rainfall and subsequent San Jacinto River recharge in Upper Pressure and Canyon.

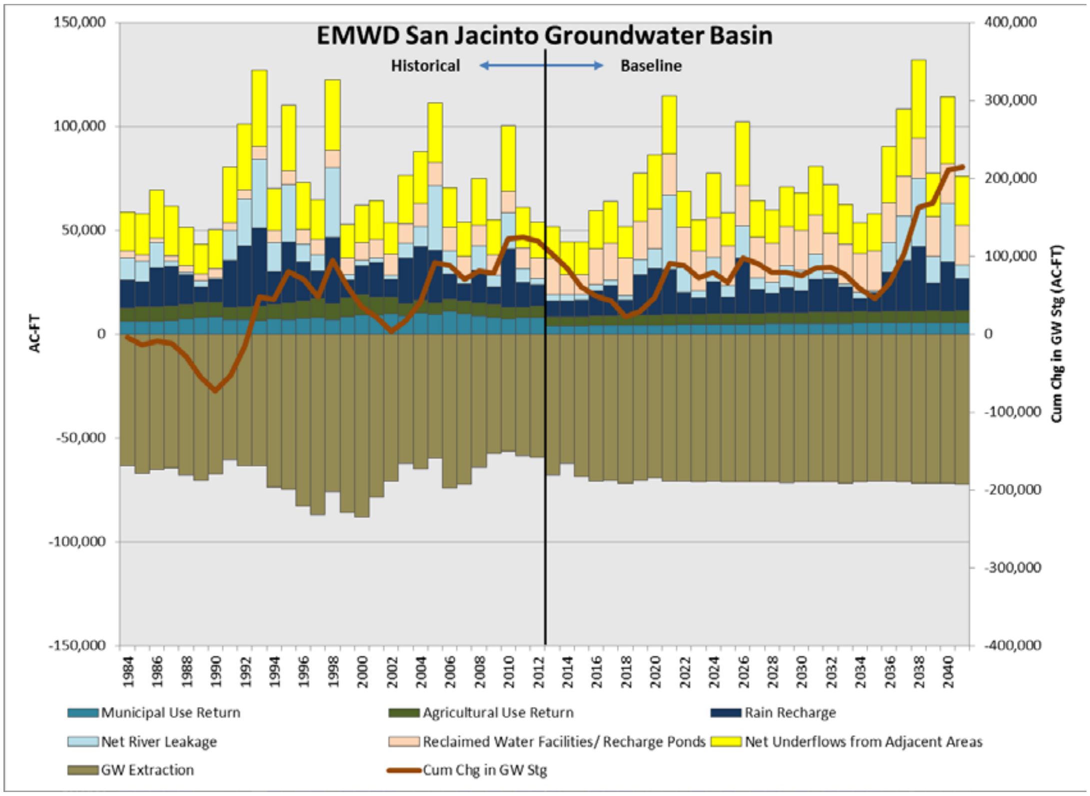


Figure 103: Baseline Water Budget Results and Cumulative Storage for the San Jacinto Groundwater Basin

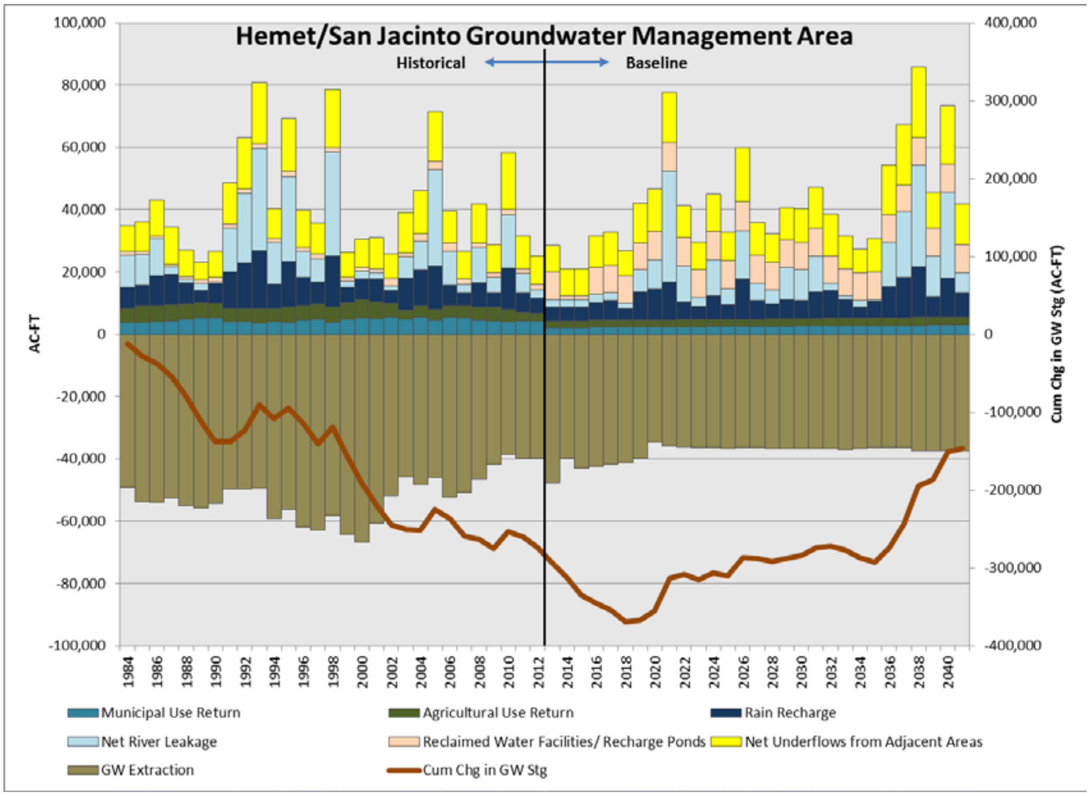


Figure 104: Baseline Water Budget Results and Cumulative Storage for the Hemet-San Jacinto Groundwater Management Area

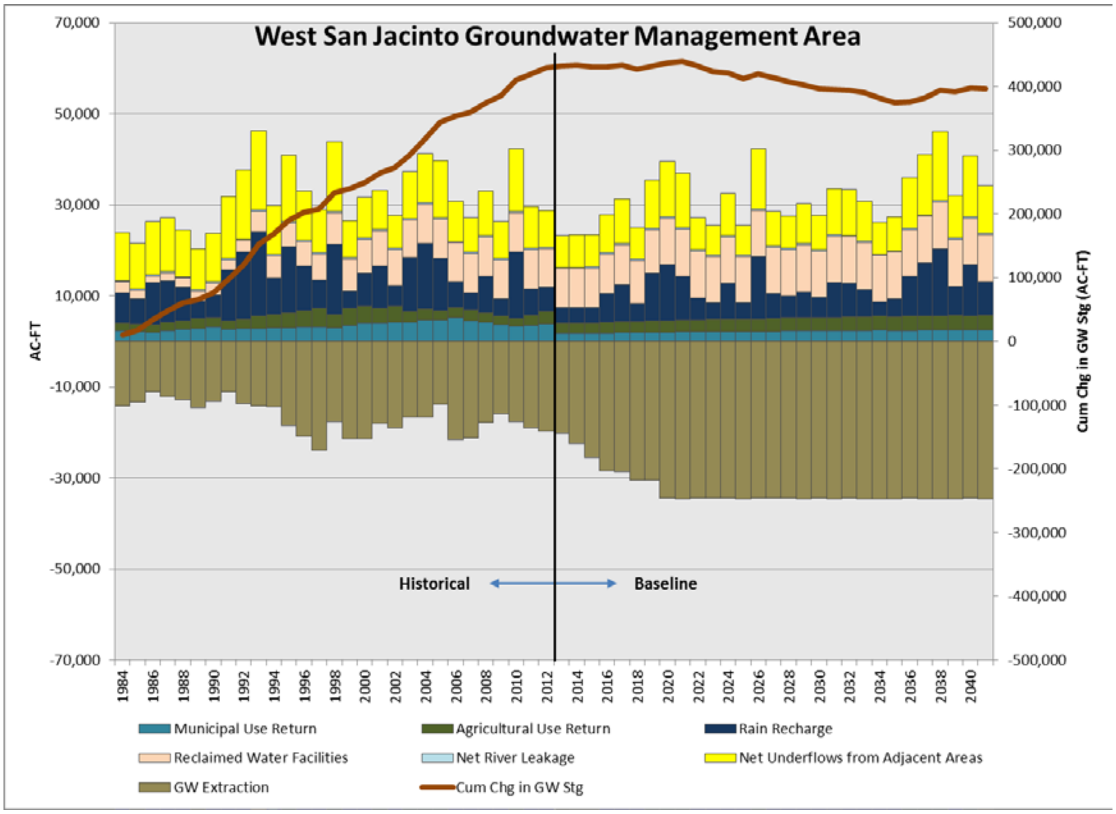


Figure 105: Baseline Water Budget Results and Cumulative Storage for the West San Jacinto Groundwater Management Area

5.2 Model Scenarios

5.2.1 *Scenario A: Optimize West San Jacinto Area Production*

The purpose of Scenario A was to evaluate and optimize the production of potable and desalination use in the West San Jacinto Area relative to the Baseline Scenario. Scenario A tested the additional projects currently under feasibility review and analysis focused on the Perris Valley.

These projects included building two news wells and increasing groundwater production rates from the Baseline. The two new production wells (EMWD 97 and 98) added in Scenario A are presented in Figure 106. The wells had production rates of 850 gpm (1,172 AFY) and ran 100% of the year, screened across Layers 1 and 2. The wells used screen depth information similar to nearby well EMWD 52 Follico. These wells became active in 2020. Other wells in the scenario experienced an increase in production rates from the Baseline Scenario. This included EMWD 55 Perris II, which was active starting in 2013 and started producing at an increased rate in 2016. The increased rates are provided in Table 32.

In order to support the increased groundwater production, recharge rates were increased in Perris South as well. Recharge was increased in the Skiland Ponds to 6,000 AFY starting in 2016. The Skiland ponds also operated year round instead of 6 months out of the year as seen in the baseline. This resulted in a decreased recharge rate to 0.17 ft/d from 0.20 ft/d in the Baseline, but an overall increase in recharge by approximately 2,500 AFY.

Table 32: Scenario A Increased Production Rates

Well	Baseline Production Rate	Scenario A Production Rate	Active Date	Increased Production Date
EMWD 55 Perris II	1,130 AFY	1,281 AFY	2013	2016
EMWD 94	1,333 AFY	1,372 AFY	2020	2020
EMWD 95	1,333 AFY	1,372 AFY	2020	2020
EMWD 96	1,333 AFY	1,372 AFY	2020	2020
EMWD 97*	--	1,372 AFY	2020	2020
EMWD 98*	--	1,372 AFY	2020	2020

*Note: New in Scenario A

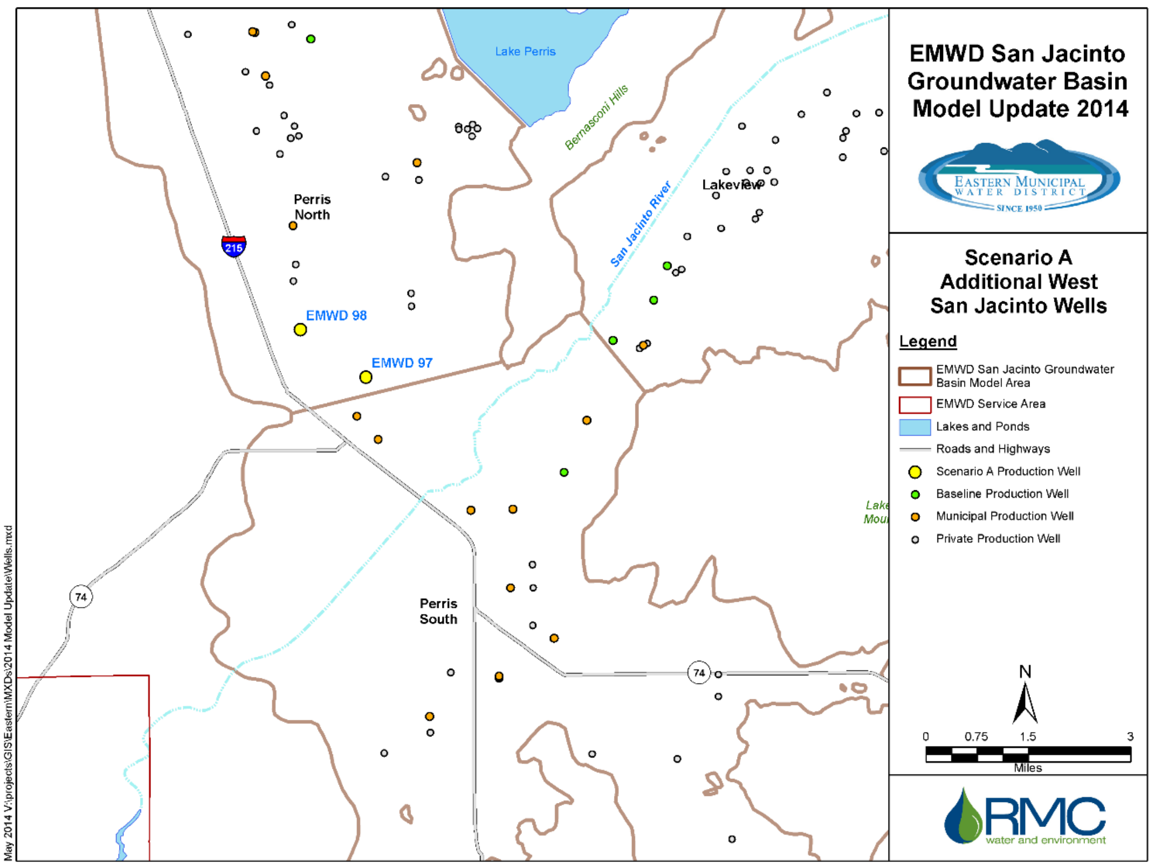


Figure 106: Scenario A Additional Production Wells in the West San Jacinto Management Area

5.2.1.1 Scenario A Results

Scenario A produced localized results in Perris North, Perris South and Lakeview, where the increases to production and recharge were applied.

As a result of the new production wells EMWD 97 and EMWD 98 and increased production at EMWD 55 Perris II, water levels in the southern portion of Perris North and northern portion of Perris South dropped by approximately 25 feet by 2041, relative to the Baseline Scenario. Figure 107 shows the hydrograph at EMWD 86 Murrieta-San Jacinto, a well located near the boundary of Perris North and Perris South. The water levels for Scenario A began to decrease relative to the Baseline in 2020 when the new production wells came online.

Water levels nearby the Skiland ponds in Perris South and Lakeview increased by 20-30 feet from the increased recharge. In addition, since the ponds operated year round in Scenario A, the seasonal fluctuations in water levels were damped, as seen in Figure 108. The increased water levels were noted east of the Skiland ponds but the impact lessened further away from the ponds. The easternmost part of Lakeview only experienced about 5 feet of increase in water levels by 2041.

The central portion of Perris South, a major production area for the brackish groundwater wells, was nearly unchanged from the Baseline (Figure 109). This may have been attributed to the balance of the increased production and recharge in the Scenario. The other GMZs in the basin did not exhibit any changes in water levels relative to the Baseline.

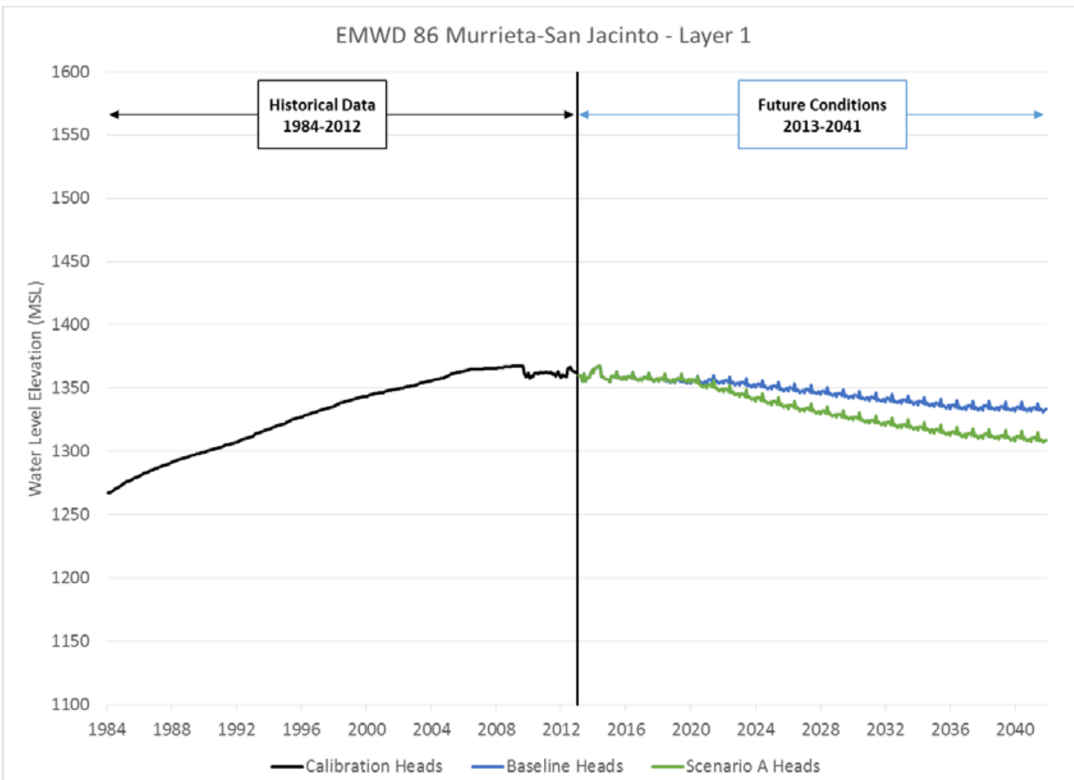


Figure 107: Scenario A Hydrograph for EMWD 86 Murrieta-San Jacinto in Northern Perris South

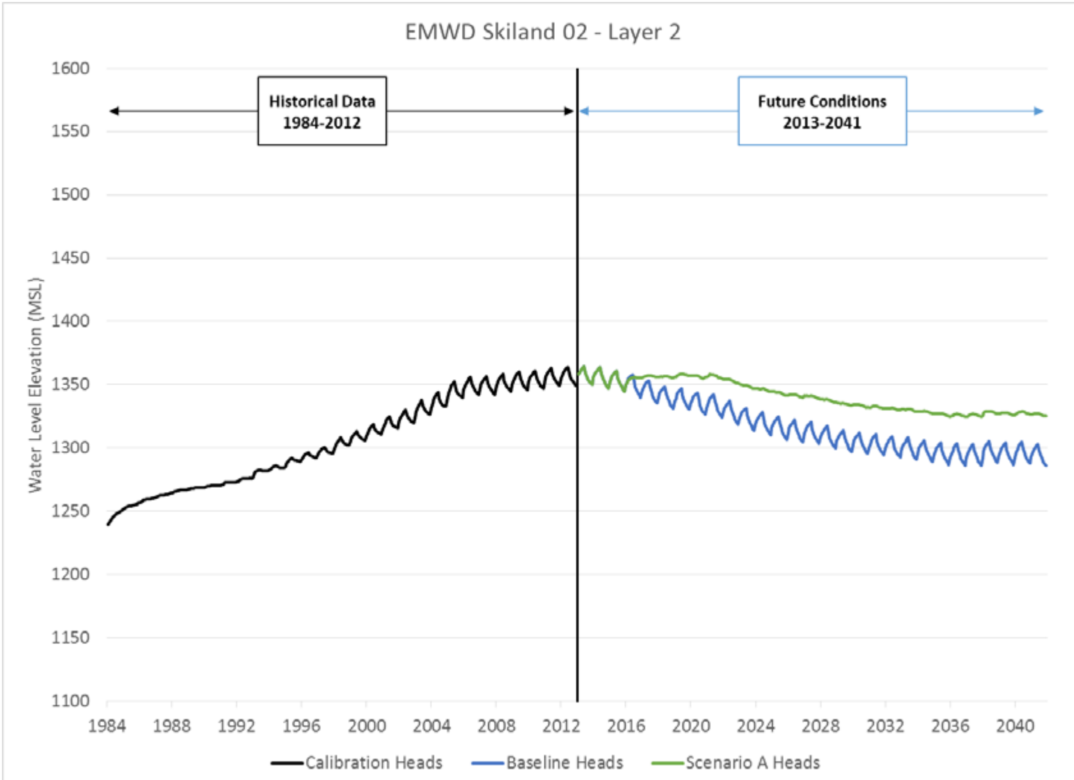


Figure 108: Scenario A Hydrograph for EMWD Skiland 01 in Perris South

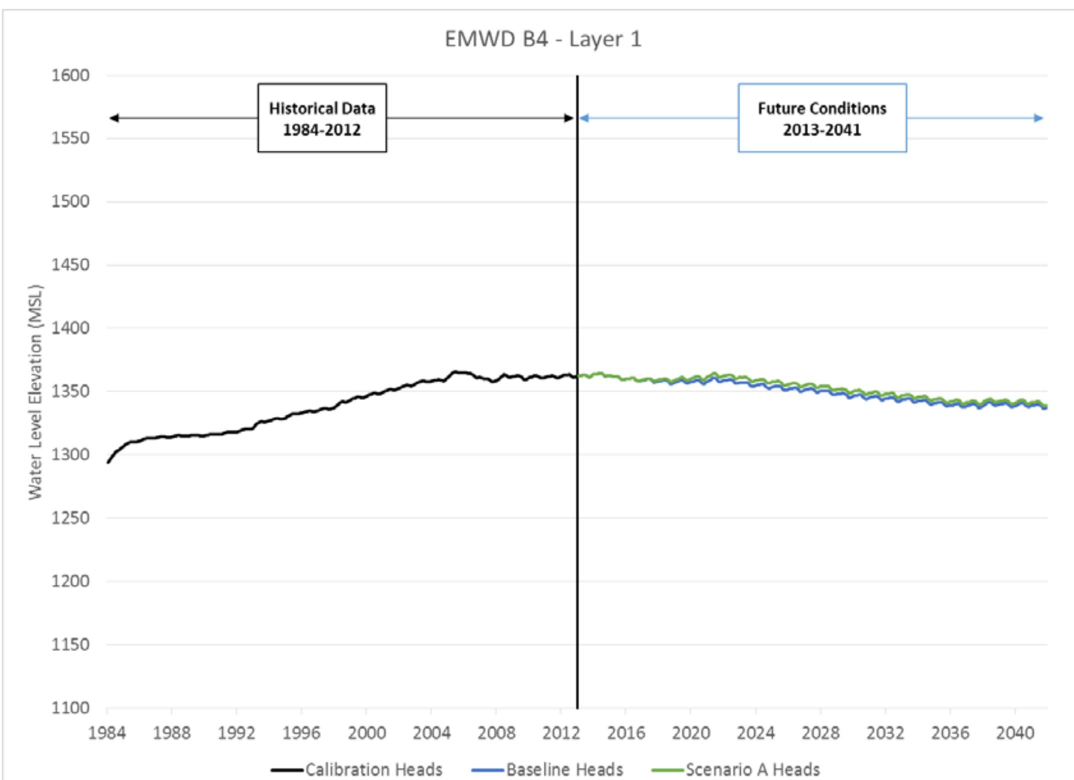


Figure 109: Scenario A Hydrograph for EMWD B4 in Central Perris South

5.2.2 *Scenario B: Drought with Water Banking*

Scenario B focused on climate change and tested the sustainability of groundwater supplies in times of increased reliance on groundwater production, specifically under a six-year drought. In Scenario B, it was assumed that an extended drought occurred over six consecutive years, reducing the rainfall and local streamflows.

Years receiving rainfall of less than the average rainfall of 10 inches were considered dry years. The timing of the drought took place from simulation year 13 to 18 corresponding to 2025 to 2030 (Figure 110). It should be noted that this timing is not based on scientific or statistical forecasting of climatology or global warming modeling, but on the assumption that an extended drought would take place sometime after the basin had sufficient time to recover from the current drought, assumed to end in 2016.

To simulate the extended six-year drought, the baseline hydrologic period years of 2026 and 2034 were switched to provide six consecutive years of rainfall less than 10 inches. The comparison of rainfall hydrology between the Baseline and Scenario B is provided in Figure 110 below.

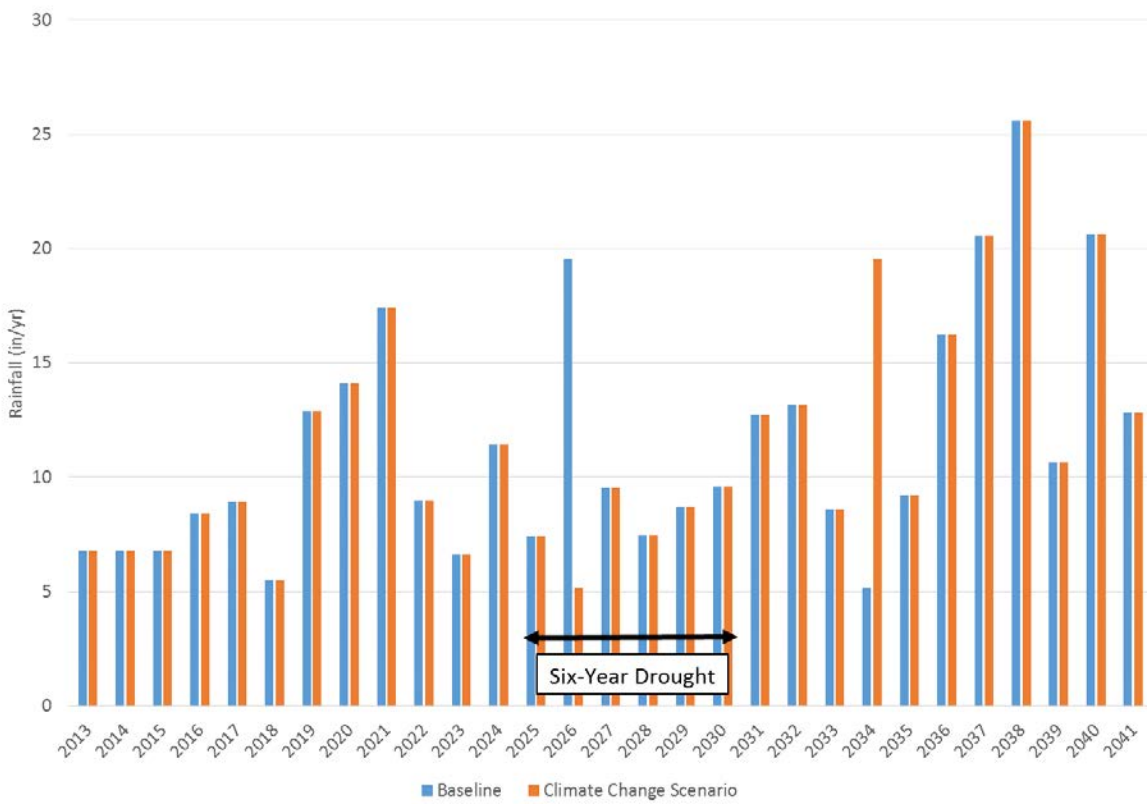


Figure 110: Baseline and Scenario B Hydrology Comparison and Drought Occurrence

Due to the change in the hydrologic period, five components are effectively changed from the Baseline Scenario:

- Rainfall
- Streamflows

- Rainfall recharge
- Point recharge (Grant Avenue Ponds and Soboba Pit)
- Mountain front recharge

These components used the rainfall hydrology presented in Figure 110. All other model components remained the same as the Baseline Scenario.

5.2.2.1 Scenario B Results

The six-year drought caused a reduction in water levels throughout the entire basin. The effect of the drought on the water levels during the drought period (2025-2030) in each GMZ is presented in Table 33.

The Upper Pressure and Canyon GMZs were most affected by the drought, averaging a decrease in water levels by 8 and 18 feet during the drought period, respectively. This was a reflection on the impact of river recharge in the two GMZs. The other GMZs experienced much smaller decreases in water levels, no more than 3 feet. Water levels in the Basin generally recovered back to Baseline conditions by the end of the study period in 2041. Figure 111 shows an example hydrograph in Upper Pressure comparing Scenario B and Baseline water levels.

Table 33: Average Impact of Six-Year Drought on Water Levels from 2025-2030 Relative to the Baseline

GMZ	Average Impact (ft)	Maximum Impact (ft)	Date of Max Impact
Perris North	-1	-4	1/1/2027
Perris South	-1	-19	1/1/2027
Menifee	-1	-3	1/1/2027
San Jacinto Lower Pressure	-3	-7	7/1/2027
Lakeview	-2	-4	2/1/2027
Hemet North	-1	-4	12/1/2030
Hemet South	-2	-3	12/1/2030
San Jacinto Upper Pressure	-8	-37	1/1/2027
San Jacinto Canyon	-18	-118	1/1/2027
San Jacinto Basin	-4	-118	1/1/2027
West San Jacinto Mgmt Area	-2	-19	1/1/2027
Hemet-San Jacinto Mgmt Area	-7	-118	1/1/2027

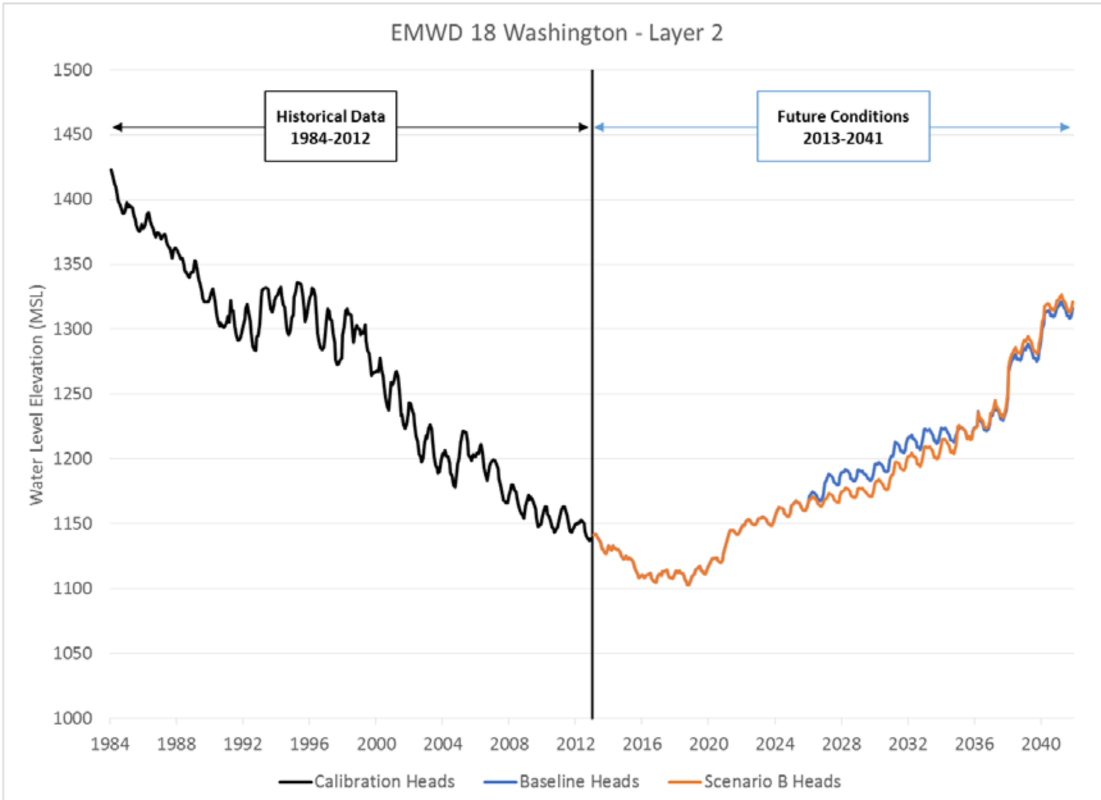


Figure 111: Scenario B Hydrograph for EMWD 18 Washington in Intake of Upper Pressure

5.2.3 *Scenario C: Drought with Constant Recharge from Water Banking*

Scenario C evaluated the feasibility of a groundwater banking project in the Upper Pressure GMZ in conjunction with the six-year drought introduced in Scenario B. The groundwater banking project involved increased recharge and the addition of new production wells to recover the banked water. The main assumptions of this scenario were:

- Add one new well in the San Jacinto Valley every two years starting in 2017 until 11 new wells were installed
- Increased recharge to offset new pumping above ABPR
- Maintain a banked water balance of 5,000 AF

5.2.3.1 New Production Wells

The location and pumping rates of the 11 new production wells to be added in Scenario C were provided by EMWD. A new well was added every two years starting in 2017. The order of the well installations were based on the EMWD Local Water Banking Program Feasibility Study performed by RMC. In this feasibility study, wells were added in increments of five after the first initial well was added (totals of 1, 6, and 11 wells). The order of installation of the wells between these increments were based on the proximity to Mountain Avenue.

The names, order and year of installation of the new production wells are provided in Table 34. The locations of the wells are shown in Figure 112. When all wells were installed and online, the wells collectively produced 62 cfs (44,886 AFY), distributed evenly amongst the wells. As a result, each added well was assumed to have a production rate of 4,081 AFY, running 100% of the year and screened across layers 2 and 3. The pumping schedule for all of the wells were based on the average pumping trends from wells EMWD 29, EMWD 25, EMWD 90, EMWD 91, EMWD 92 and EMWD 36. Screening depths were estimated using the screens of nearby wells of City of San Jacinto Lake Park and EMWD 90 Evans/Old Mountain.

Table 34: Scenario C New Production Wells

Installation Order	Year Installed	Name	Well Screen Basis
1	2017	Esplanade	EMWD 90 Evans/Old Mountain
2	2019	Crystal	EMWD 90 Evans/Old Mountain
3	2021	Las Rosas Park	EMWD 90 Evans/Old Mountain
4	2023	Idyllwild	City of San Jacinto Lake Park
5	2025	Soboba	EMWD 90 Evans/Old Mountain
6	2027	Lake	EMWD 90 Evans/Old Mountain
7	2029	Elderberry	City of San Jacinto Lake Park
8	2031	Ramona 1	City of San Jacinto Lake Park
9	2033	Ramona 2	City of San Jacinto Lake Park
10	2035	Shoal Reef	City of San Jacinto Lake Park
11	2037	Vernon	City of San Jacinto Lake Park

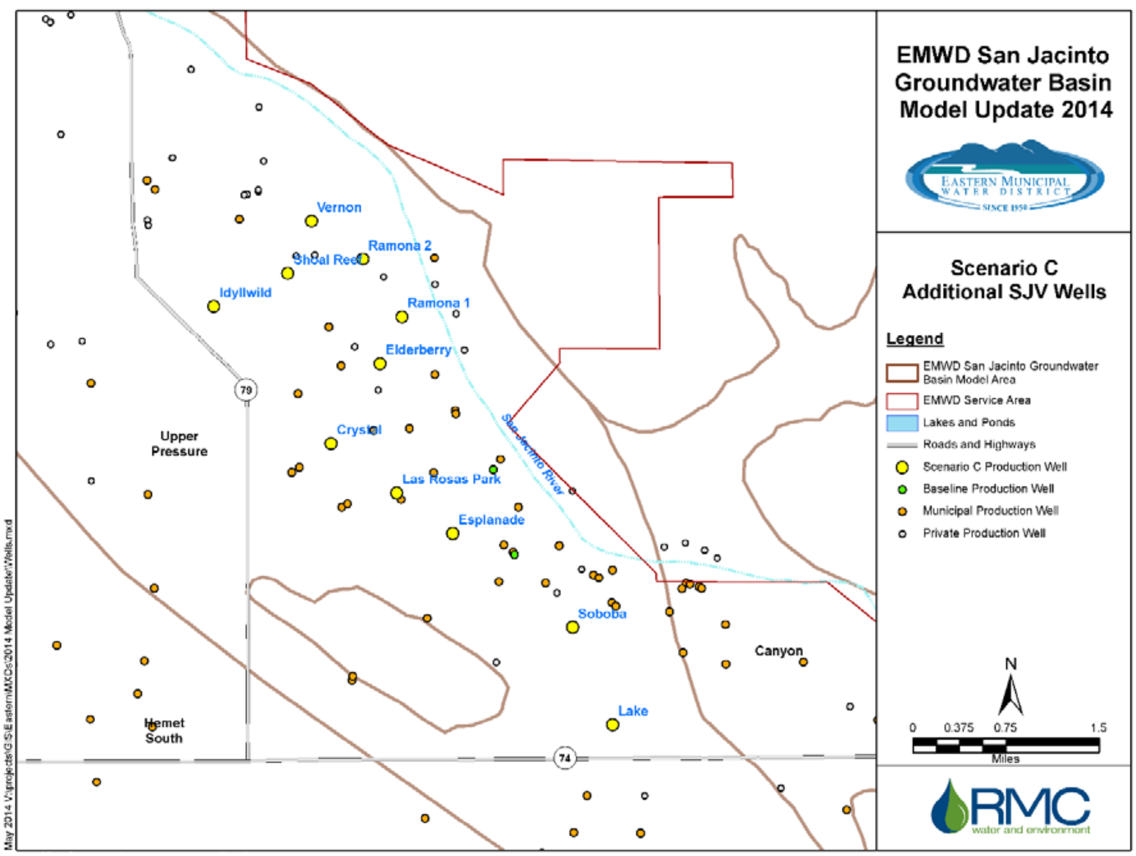


Figure 112: Scenario C Additional San Jacinto Valley Wells

5.2.3.2 Increased Recharge

In order to simulate the groundwater banking project, groundwater recharge was increased in Scenario C. Three new recharge ponds were added in the San Jacinto Valley: Mountain Avenue West, Mountain Avenue East, and Mountain Avenue North ponds. The location of these ponds are shown in Figure 113. The new recharge rates were to maintain the banked water balance of 5,000 AF by following the recharge schedule found below.

- 24,000 AFY recharged during dry years
- 54,000 AFY recharged during wet or normal years

A dry year was defined as a year with rainfall of 10 inches or less. Similar to the baseline, 7,500 AFY was recharged to the IRRP ponds to satisfy the Soboba Settlement. The remaining recharge amount was recharged at the Mountain Avenue ponds, distributed evenly amongst the three new ponds. This equated to 16,500 AFY in dry years and 46,500 AFY in wet years in the three Mountain Avenue ponds, or 5,500 AFY and 15,500 AFY per pond, respectively. Mountain Avenue ponds are assumed to became operational starting 2016 and operate year round. The recharge rates for both wet and dry years are provided in Table 35. It is assumed that Mountain Avenue West, East, and North ponds areas are 30, 13.8, and 4.5 acres, respectively.

Table 35: Scenario C Added Recharge Pond Rates

Recharge Pond	Operation Period	Dry Year Recharge Rate (ft/day)	Wet Year Recharge Rate (ft/day)
Mountain Ave West	12 months/year	0.50	1.42
Mountain Ave East	12 months/year	1.09	3.06
Mountain Ave North	12 months/year	3.36	9.46

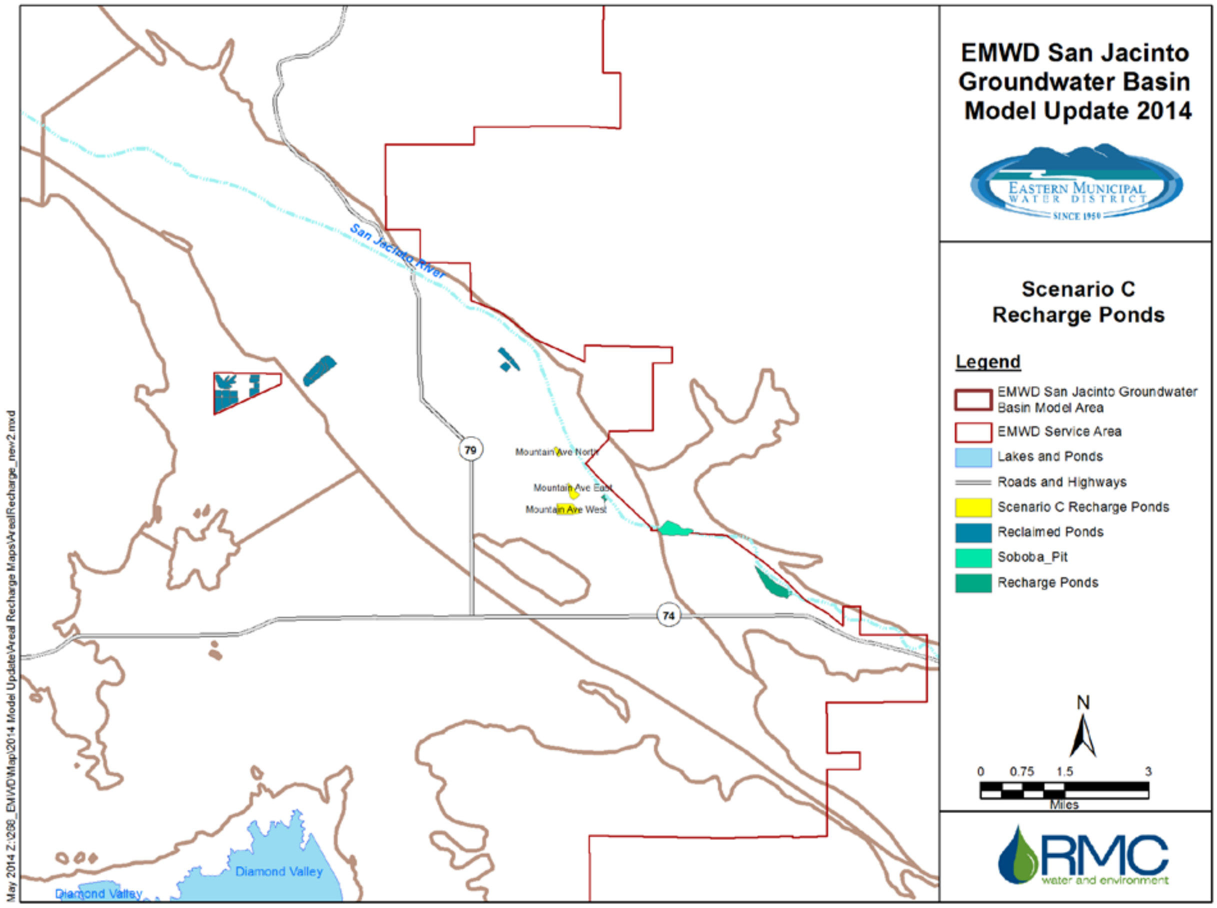


Figure 113: Scenario C Recharge Ponds

5.2.3.3 Scenario C Results

The increased recharge from the groundwater banking project had significant effects in Upper Pressure and surrounding basins. Table 36 shows the impact on water levels during the drought period for each GMZ between Scenario B and Scenario C.

The increased recharge caused water level increases as high as 200 feet in areas in Upper Pressure. This rise in water levels had a subsequent effect on the GMZs flowing into Upper Pressure. Underflows from Lower Pressure and Hemet South to Upper Pressure were reduced, causing an increase in water levels in the GMZs. Hemet North was also affected. The underflows to Hemet South decreased, creating an increase in Hemet North water levels most noticeable in the southern portion of the GMZ.

By 2027, the addition of new wells production wells started to balance out the effects of the increased recharge in Upper Pressure, but Scenario C water levels still remained higher than Scenario B by the end of the study period, as seen in Figure 114.

Table 36: Average Impact of Six-Year Drought on Water Levels from 2025-2030 Relative to Scenario B

GMZ	Average Impact (ft)	Maximum Impact (ft)	Date of Max Impact
Perris North	0	1	12/1/2030
Perris South	0	0	6/1/2025
Menifee	0	0	10/1/2026
San Jacinto Lower Pressure	7	30	12/1/2030
Lakeview	0	0	12/1/2030
Hemet North	4	20	9/1/2029
Hemet South	5	11	12/1/2030
San Jacinto Upper Pressure	101	202	3/1/2025
San Jacinto Canyon	0	0	3/1/2025
San Jacinto Basin	13	202	1/1/2027
West San Jacinto Mgmt Area	1	30	12/1/2030
Hemet-San Jacinto Mgmt Area	28	202	1/1/2027

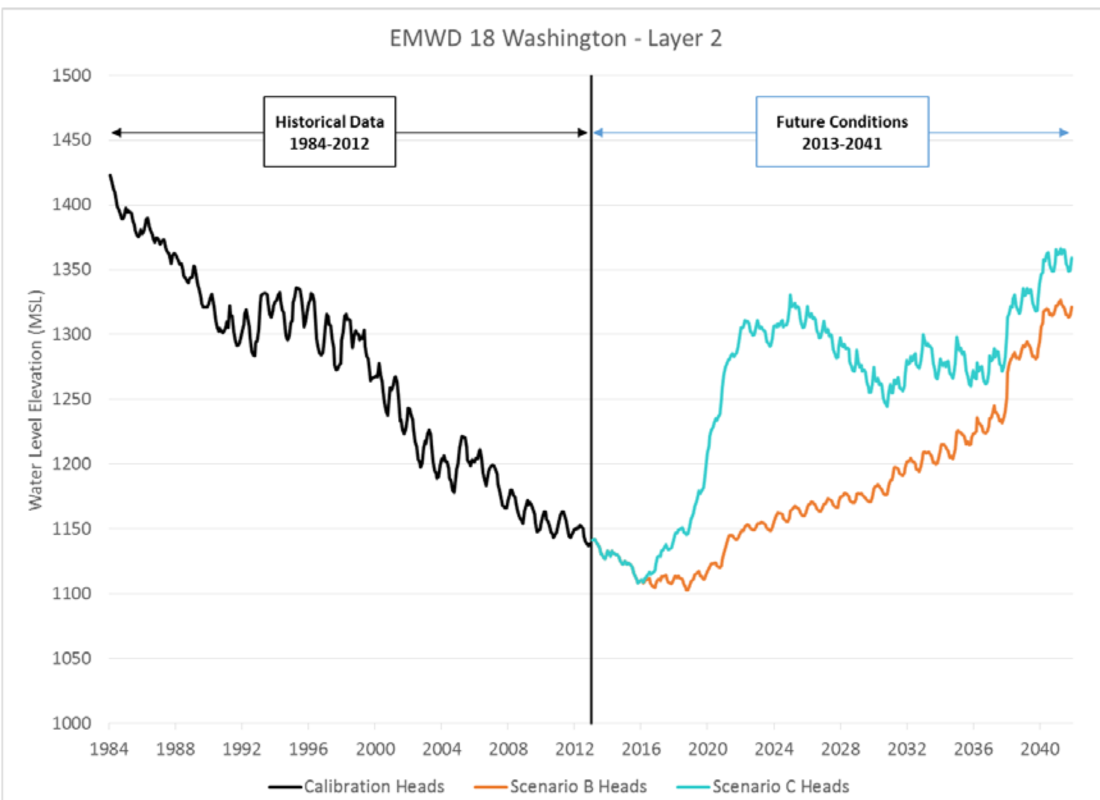


Figure 114: Scenario C Hydrograph for EMWD 18 Washington in Intake of Upper Pressure

5.2.4 *Scenario D: Build-Out with Water Banking and 10-Year Hydrologic Cycles*

Scenario D was used to create a comparative base to determine impacts of various projects and alternatives. This as a stand-alone scenario and is not to be compared with the other scenarios. It is to serve as a baseline for other potential scenarios. For Scenario D, a new hypothetical and repeating 10-year hydrology was created while combining other model components of Scenarios A through C. It is important to note that Scenario D had no phasing of projects, so all new pumping rates, recharge, or projects--including production wells and recharge ponds—were implemented and online starting in the first year of the simulation (i.e. 2013).

5.2.4.1 10-Year Repeating Hydrologic Period

A new hydrologic period was created for Scenario D. It consisted of a 10-year hydrology of three wet years, four average years and three dry years used and repeated for the entirety of the study period, starting with three wet years in 2013. The data for the hydrologic cycle was based on the following years and presented in Table 37:

- Use 1991-1993 for wet years
- Use 1986-1987 repeated twice for average years
- Use 2000-2002 for dry years

Table 37: Scenario D Hydrologic Period and Matching Historical Hydrology

Scenario D Simulation Year	1	2	3	4	5	6	7	8	9	10
Model Calendar Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Matching Historical Hydrology Year	1991	1992	1993	1986	1987	1986	1987	2000	2001	2002
Observed Rainfall (in/yr)	16.2	20.6	25.6	12.7	13.1	12.7	13.1	8.4	9.0	5.5
Scenario D Simulation Year	11	12	13	14	15	16	17	18	19	20
Model Calendar Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Matching Historical Hydrology Year	1991	1992	1993	1986	1987	1986	1987	2000	2001	2002
Observed Rainfall (in/yr)	16.2	20.6	25.6	12.7	13.1	12.7	13.1	8.4	9.0	5.5
Scenario D Simulation Year	21	22	23	24	25	26	27	28	29	
Model Calendar Year	2033	2034	2035	2036	2037	2038	2039	2040	2041	
Matching Historical Hydrology Year	1991	1992	1993	1986	1987	1986	1987	2000	2001	
Observed Rainfall (in/yr)	16.2	20.6	25.6	12.7	13.1	12.7	13.1	8.4	9.0	

It should be noted that the final year of the final 10-year cycle was cut off by one year due to a simulation period of 29 years.

Due to the new hydrologic period, five model components were changed relative to the Baseline scenario and used the repeating 10-year hydrologic cycle as shown in Table 37. These components included:

- Rainfall
- Streamflows
- Rainfall recharge
- Point recharge (Grant Avenue Ponds and Soboba Pit)
- Mountain front recharge

5.2.4.2 Increased Production

Increased production and new wells relative to the Baseline Scenario included those introduced in Scenario A and Scenario C, but all became active beginning in 2013. As a result, 13 new wells were added at the start of the scenario. A summary of pumping rates and new wells are summarized in Table 38. Newly installed wells can be seen in Figure 106 and Figure 112.

Table 38: Scenario D New Wells and Increased Production Rates

Well Name	GMZ	Scenario D Production Rate
New Wells		
Esplanade	Upper Pressure	4,081 AFY
Crystal	Upper Pressure	4,081 AFY
Las Rosas Park	Upper Pressure	4,081 AFY
Idyllwild	Upper Pressure	4,081 AFY
Soboba	Upper Pressure	4,081 AFY
Lake	Upper Pressure	4,081 AFY
Elderberry	Upper Pressure	4,081 AFY
Ramona 1	Upper Pressure	4,081 AFY
Ramona 2	Upper Pressure	4,081 AFY
Shoal Reef	Upper Pressure	4,081 AFY
Vernon	Upper Pressure	4,081 AFY
EMWD 97	Perris North	1,372 AFY
EMWD 98	Perris North	1,372 AFY
Existing Wells from Baseline		
EMWD 94	Lakeview	1,372 AFY
EMWD 95	Lakeview	1,372 AFY
EMWD 96	Perris South	1,372 AFY
EMWD 55 Perris II	Perris North	1,281 AFY

5.2.4.3 Increased Recharge

Similar to production, all new recharge rates and ponds came into effect starting in 2013. This included the 6,000 AFY in the Skiland Ponds running year round and the 16,500 AFY and 46,500 AFY in the new Mountain Avenue Ponds in dry and wet years, respectively. A dry year was defined as a year with less than 10 inches of rainfall. The location of the new ponds can be seen in Figure 113.

5.2.4.4 Scenario D Results

The Scenario D water budget and cumulative storage results are presented in Figure 115 through Figure 117. Although Scenario D is a stand-alone scenario, it should be noted that the cumulative storage levels reacted similarly to those in the Baseline Scenario. The West San Jacinto Management Area storage were mostly stabilized with a slight negative trend, as the added recharge and pumping in the area balanced out. The Hemet-San Jacinto Management Area follows the trend of the rainfall, reinforcing the significant effect of San Jacinto River recharge in Upper Pressure and Canyon.

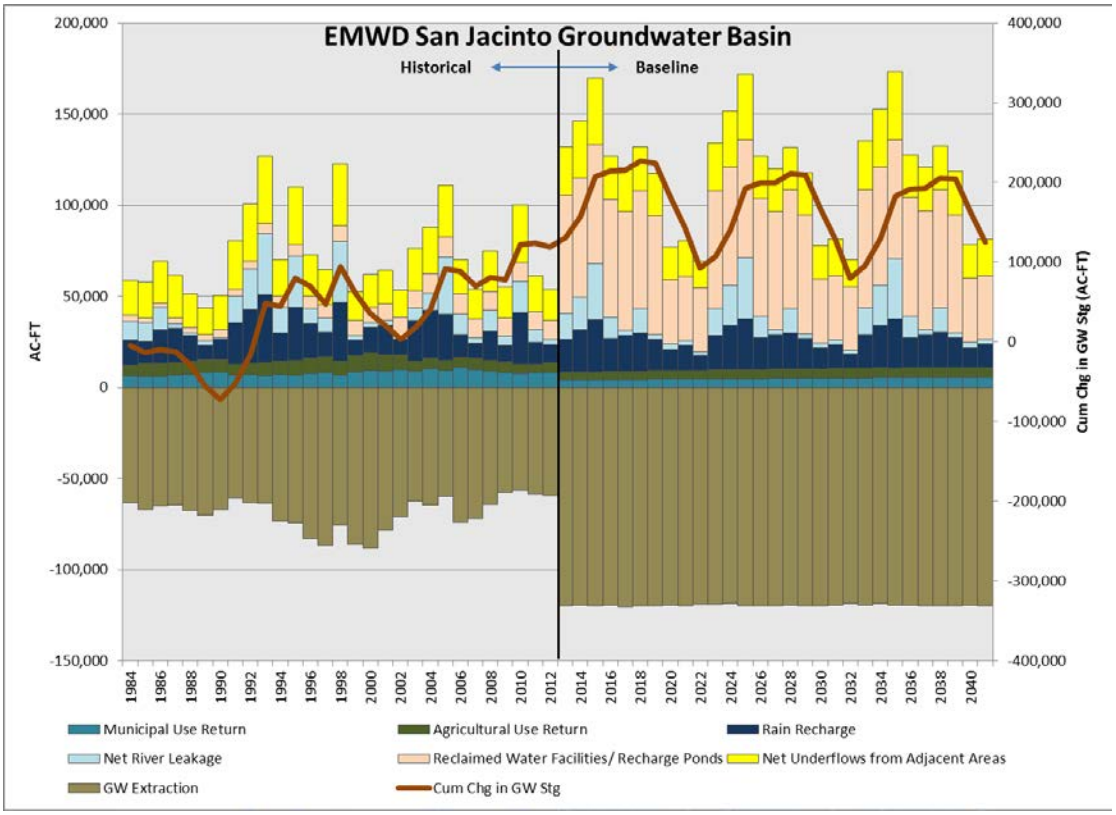


Figure 115: Scenario D Results and Cumulative Storage for the San Jacinto Groundwater Basin

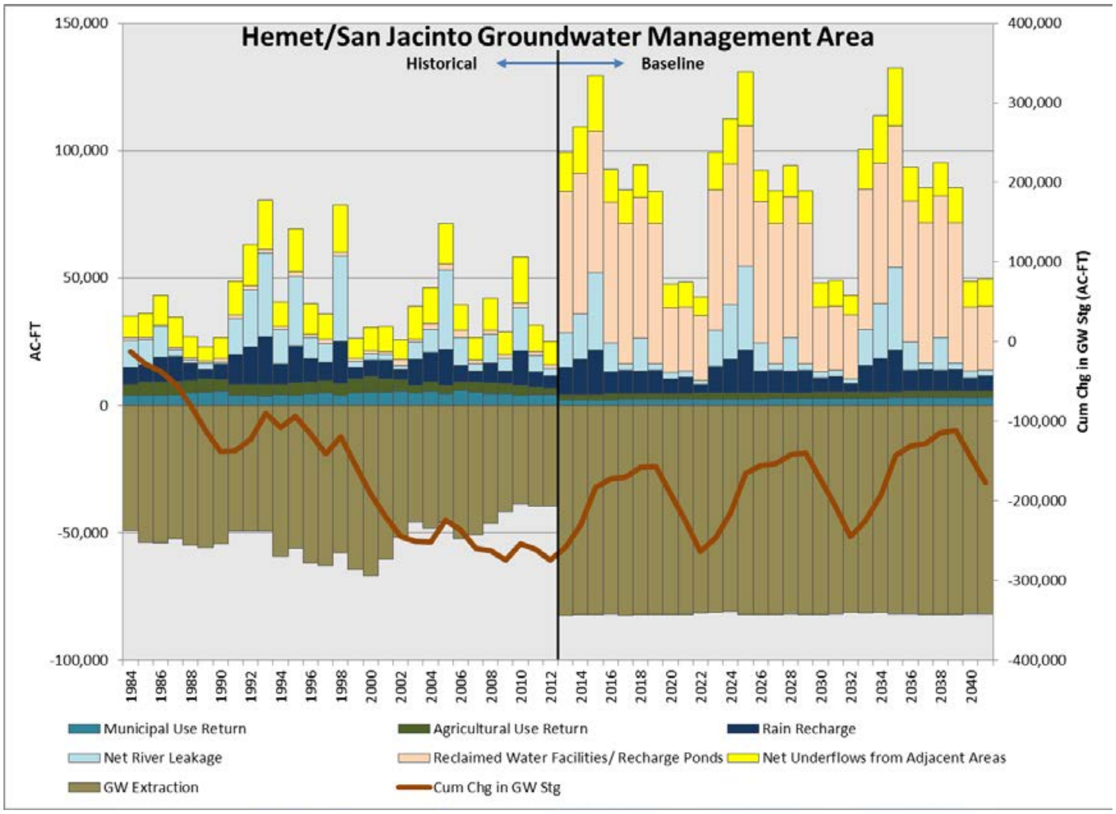


Figure 116: Scenario D Results and Cumulative Storage for the Hemet-San Jacinto Groundwater Management Area

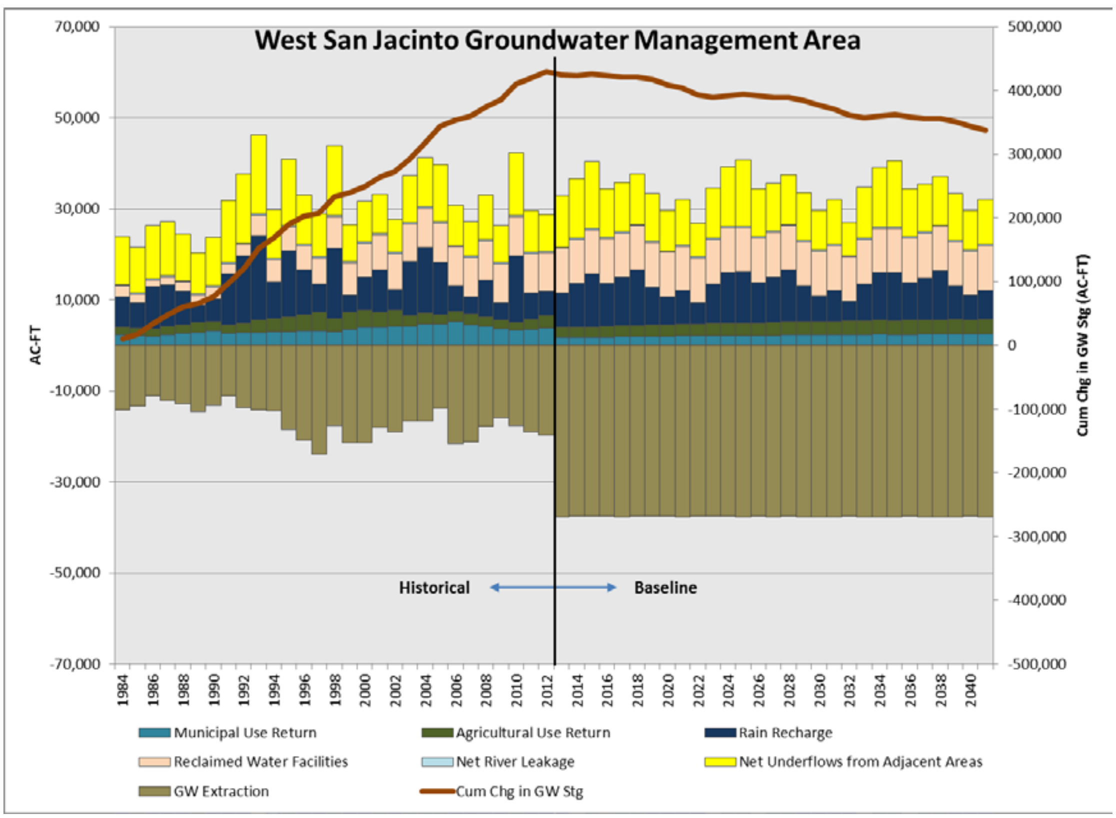


Figure 117: Scenario D Results and Cumulative Storage for the West San Jacinto Groundwater Management Area

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Section 6 Summary and Recommendations

SJFM-2014 Model is a state-of-the-art peer-reviewed regional water resources model that will help manage the San Jacinto Groundwater Basin from both a local and regional perspective. It integrates the surface water hydrologic system, the groundwater aquifer system, and the land-surface processes into a single model. It allows the water managers and decision makers to evaluate the effect of changes to the agricultural and/or municipal water demands, land use and water use, groundwater pumping, imported water recharge, and other water planning measures. SJFM-2014 is an important analytical tool for evaluation of the water management programs in the San Jacinto Basin.

Development of SJFM-2014 has yielded science-based results that can be used for current and future planning needs. SJFM-2014 was developed based on data collected and analysis performed over the 12-year period since SJFTM-2002 was developed. It could be used in support of projects and analyses by stakeholders in area such as:

- Hemet-San Jacinto Watermaster
- Cities of
  - Perris
  - San Jacinto
  - Hemet
- Eastern Municipal Water District
- Lake Hemet Municipal Water District
- Soboba Band of Luiseño Indians
- Santa Ana Watershed Project Authority (SAWPA)
- State of California Agencies
  - Department of Water Resources
  - Santa Ana Regional Water Quality Control Board

This section provides recommendations for application of SJFM-2014 to simulation of water resources projects in the San Jacinto Groundwater Basin and improving the capability of the SJFM-2014 in future updates as additional data become available. The recommendations are grouped into several categories:

- Application of SJFM-2014 Model
- Groundwater and surface water data updates
- Stratigraphy/geology data updates
- Water quality model update
- Advisory Panel recommendations

6.1 Application of SJFM-2014 Model

SJFM-2014 Model is calibrated to be used extensively for simulation and analysis of water resources planning and management projects in the San Jacinto Groundwater Basin, such as:

- Assessment of conjunctive use projects
- Evaluation of effectiveness of water banking and transfer projects
- Assessment of recycled water use in agricultural and/or urban areas
- Evaluation of climate change adaptation and mitigation measures
- Analysis supporting changes in basin boundaries
- Development of Groundwater Sustainability Plans (GSPs) as part of requirements of the Sustainable Groundwater Management Act (SGMA)
- Estimation of safe yield and/or sustainable yield
- Assessment of potential effects of regional projects and programs proposed by local cities, water districts, and regional agencies including
    - Improving drought reliability
    - Optimization of local groundwater supplies
    - Minimizing recycled water discharge from the Basin
    - Mitigation of groundwater solutes
    - Groundwater Desalination Program
    - Integrated Recharge and Recovery Program
    - Groundwater Monitoring Programs
    - Recycled Water Program
    - Well Development Program
    - Indirect Potable Reuse Program

The intended use of the SJFM-2014 Model is for analysis of water resources planning and management scenarios at a regional scale. However, detailed local conditions could be simulated using more site-specific models which could be linked to the SJFM-2014 Model. A recent example is use of SJFM-2014 Model for development of a detailed model for analysis of the Integrated Recharge and Recovery Program (IRRP) project in the Upper Pressure GMZ.

6.2 Groundwater and Surface Water Data Updates

Extensive groundwater and surface water monitoring and data collection activities have been conducted by EMWD and other agencies in the Basin in recent years. The data collection efforts have led to development of very comprehensive and robust datasets, which were used in development and calibration of the SJFM-2014. Use of these datasets let to recognition of data gaps, where characterization and simulation of local groundwater conditions by the SJFM-2014 Model could be improved in the future updates of the model by using additional data. The following subsections describe the areas that could benefit from additional data.

Groundwater Monitoring

During calibration of the SJFM-2014, several areas were noted where additional data and increased monitoring frequency would benefit the future updates of the model. In general, additional data collection would benefit future modeling efforts by providing additional:

- Water level data

- Depth/layer specific water level data in main pumping zones
- Aquifer test data
- Lithology data
- Water quality data

There are a total of 13 areas identified for additional groundwater elevation monitoring. Five areas are in the West San Jacinto Management Area and eight areas are in the Hemet-San Jacinto Management Area. Figure 118 through Figure 120 present these areas in comparison to locations of calibration wells, major groundwater production locations and availability of layer specific water elevation data. Table 39 presents a summary of recommended monitoring efforts for each area. For many of the identified areas it is recommended to improve understanding of groundwater flow system by incorporating additional layer specific water level data. Layer specific water level data may be obtained a) from newly installed monitoring wells that target specific zones and layers of the aquifer or b) from existing monitoring wells with screen spanning more than one model layer.

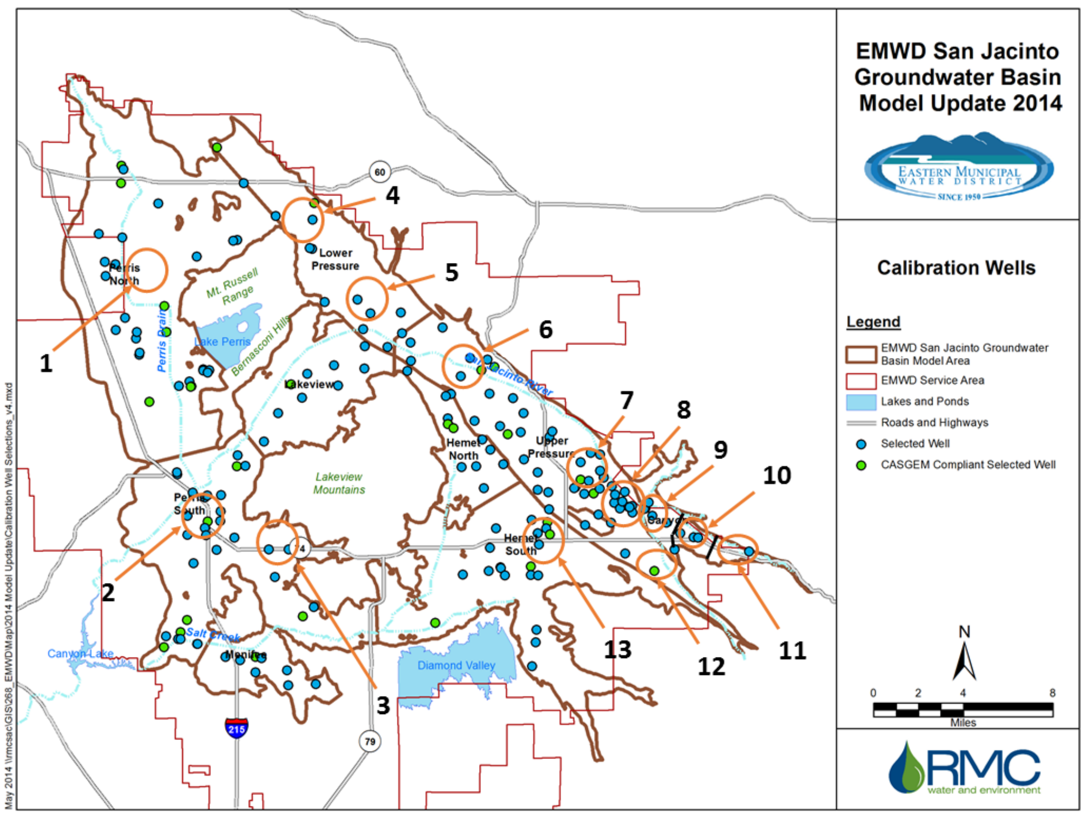

Figure 118: Areas Recommended for Additional Monitoring in Comparison to Locations of SJFM-2014 Calibration Wells

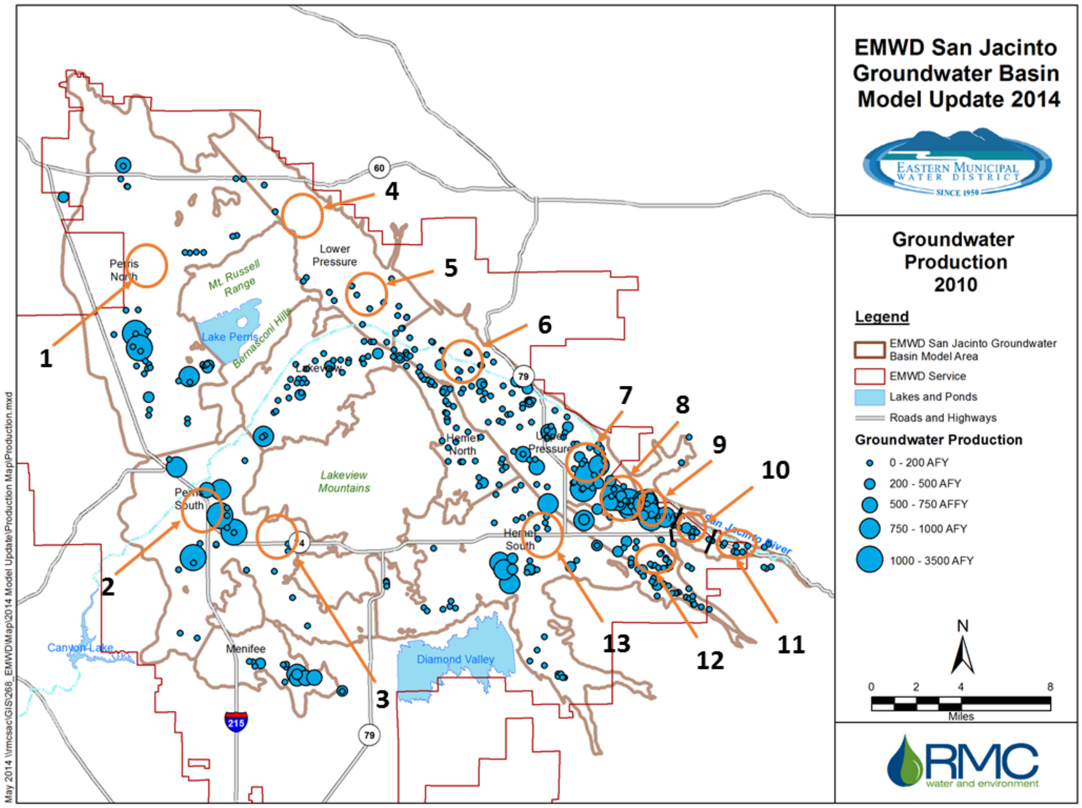

Figure 119: Areas Recommended for Additional Monitoring in Comparison to Locations of Production Wells in 2010

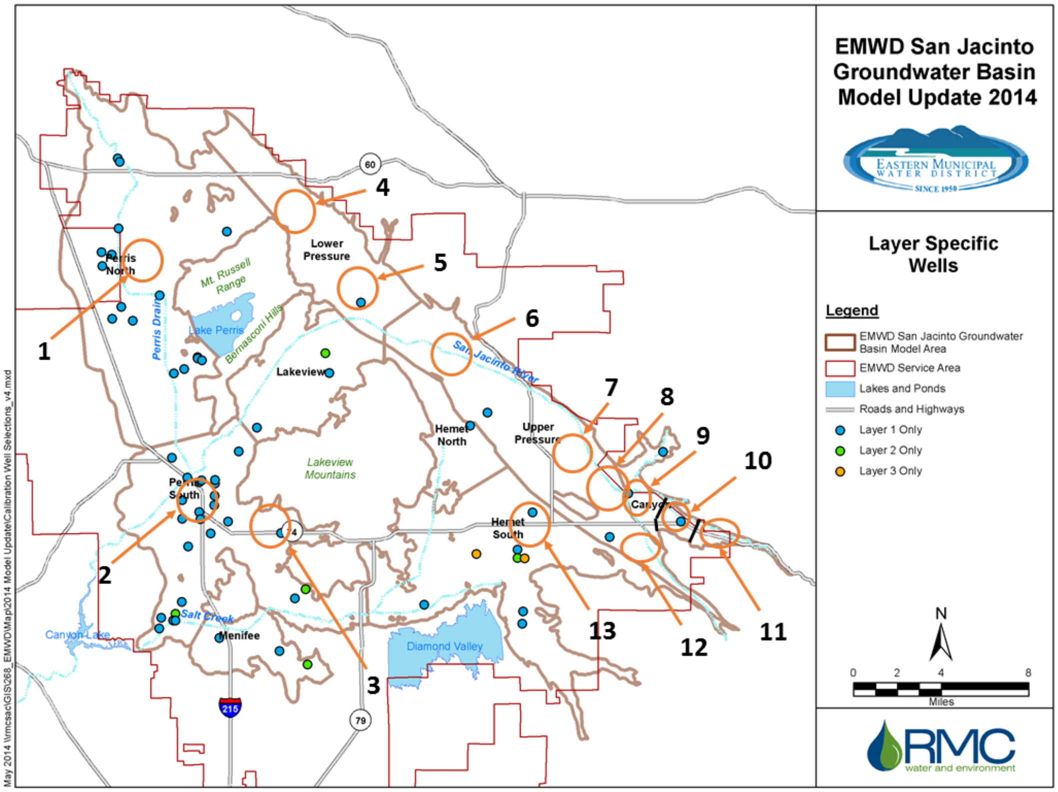

Figure 120: Areas Recommended for Additional Monitoring in Comparison to Locations of Model Layer Specific Calibration Wells

Table 39: Areas Recommended for Additional Monitoring

Area Number	Recommended Monitoring
West San Jacinto Management Area	
1	Understanding of the groundwater flow system from March Air Reserve Base (MARB) Area to the main part of Perris North GMZ could be improved by additional water level data.
2	Understanding of the groundwater flow system in the high production and brackish groundwater area in Central parts of Perris South could be improved by additional layer specific water level data for model layers 2 and 3.
3	Understanding of the groundwater flow system in the eastern parts of Perris South, where groundwater flows along Highway 74 from Winchester area and Lakeview Mountains towards the central parts of Perris North GMZ could be improved by additional water level data.
4	No layer specific water level data is available in northern parts of Lower Pressure GMZ.
5	Limited layer specific water level data is available in southern parts of Lower Pressure GMZ.
Hemet-San Jacinto Management Area	
6	Understanding of the groundwater flow system in the northern parts of Upper Pressure GMZ where a groundwater depression existed in recent years and several wells with water level conflicts exist in the area, could be improved by additional layer specific water level data.
7	Understanding of the groundwater flow system in areas north of Intake area with high groundwater production and planned future recharge projects could be improved by additional layer specific water level data.
8	Understanding of the groundwater flow system in Intake area with high groundwater production and existing and future recharge projects could be improved by additional layer specific water level data.
9	Understanding of groundwater flow system in the Cienega area of Canyon with high groundwater production and significant surface water and groundwater interaction could be improved by additional model-layer specific water level data.
10	Understanding of groundwater flow system in the Canyon Zone 2 with high groundwater production and significant surface water and groundwater interaction could be improved by model-layer specific water level data.
11	Understanding of groundwater flow system in Canyon Zone 3 with significant surface water and groundwater interaction could be improved by new monitoring wells and model-layer specific water level data.
12	Understanding of groundwater flow system in Bautista Creek area where steep bedrock slopes and changes in layer elevations are present and water quality is poor could be improved by more model-layer specific water level data.
13	Understanding of groundwater flow system in the main production area of Hemet South with high groundwater production and poor water quality could be improved by more model-layer specific water level data.

As data collection efforts in all of the recommended areas in Table 39 may not be feasible, a priority order is recommended for based on the benefit to future update of the SJFM-2014 Model. Areas of known high production, areas of future increased production and areas in key GMZs were given higher priority. The priority order, estimated total depth of active aquifer and the corresponding model layers are presented in Table 40.

Table 40: Priority Order of Areas Recommended for Additional Monitoring

Priority	Area Number	General Location	Estimated Total Depth of Active Aquifer	Corresponding Model Layers
Hemet-San Jacinto Management Area				
1	8	Upper Pressure - Intake	1,300 ft	Layers 2-3
2	7	Upper Pressure - Northern Intake	1,100 ft	Layers 2-3
3	9	Canyon, Section 1 – Cienega Area	1,100 ft	Layers 1-3
4	10	Canyon, Section 2 - LHMWD Area	1,130 ft	Layers 1-3
5	6	Northern Upper Pressure, Groundwater Depression Area	1,030 ft	Layers 1-3
6	12	Southern Upper Pressure, Bautista Creek Area	470 ft	Layers 1-4
7	11	Canyon, Section 3 – Easternmost Canyon	1,170 ft	Layers 1-3
8	13	Hemet South – Main Production Area	830 ft	Layers 1-3
West San Jacinto Management Area				
1	2	Perris South – Main Production and Brackish Groundwater Well Area	780 ft	Layers 1-3
2	3	East Perris South – Perched Water Area	590 ft	Layers 1-2
3	1	Perris North – East of MARB	90 ft	Layer 1
4	4	Northern Lower Pressure	1,580 ft	Layers 1-4
5	5	Southern Lower Pressure	1,420 ft	Layers 1-4

Groundwater and Surface Water Inflow Quantities

Groundwater inflows have a significant impact on the groundwater flow system in the Basin and are important components of the water budgets for the Basin. This information is vital for establishing the safe yield estimate for each GMZ, which is used for evaluation of future projects and operation of the Basin. While groundwater production in the Basin is frequently monitored, there are several data gaps in the inflow components.

Groundwater inflow components include recharge from applied water, reclaimed water facilities and recharge ponds, rivers, and mountain front recharge. Generally the inflows are estimated and calibrated during the model calibration. As shown in Table 41, on average, applied water recharge comprises 45% of the inflow to the Basin with rain recharge contributing 24% of the inflow.

Table 41: Groundwater Inflow Component Breakdown Based on Simulated 1984-2012 Water Budgets

Groundwater Inflow Component	Total Percentage of Inflow		
	Total Basin	Hemet-San Jacinto	West San Jacinto
Applied Water Inflow Component	*45%*	*46%*	*42%*
EMWD Sales	7%	5%	9%
Irrigation Recharge	7%	9%	4%
Rain Recharge	24%	23%	26%
Reclaimed Water Sales	3%	2%	3%
Subagency Sales	4%	7%	0%
Other Inflow Components	*55%*	*54%*	*58%*
Reclaimed/Recharge Ponds	10%	4%	17%
River Recharge	15%	27%	1%
Mountain Front Recharge	25%	23%	29%
Boundary Conditions (Reservoir Underflow)	5%	0%	11%

The next two significant components are mountain front recharge (25%) and river recharge (15%). It should be noted that river recharge is the largest component of inflow in the Hemet-San Jacinto Groundwater Management Area; however, no flow gauges exist below Cranston Gage in the Canyon GMZ for the San Jacinto River and its tributaries. River recharge has a significant influence on groundwater levels but its detailed locations are not clearly defined in the Canyon GMZ.

Based on the above discussion, estimation of groundwater inflow components could be improved by additional data for the following:

- Mountain front recharge estimates
- River recharge estimates for
  - San Jacinto River tributary flows (Indian and Poppet Creek)
  - San Jacinto River recharge distribution in Canyon
  - San Jacinto River flows from Canyon into Upper Pressure
  - Soboba Pit
- Reclaimed water pond incidental recharge rates

Locations of some of these areas are provided in Figure 121 and Table 42 describes the inflow monitoring needs in each respective area.

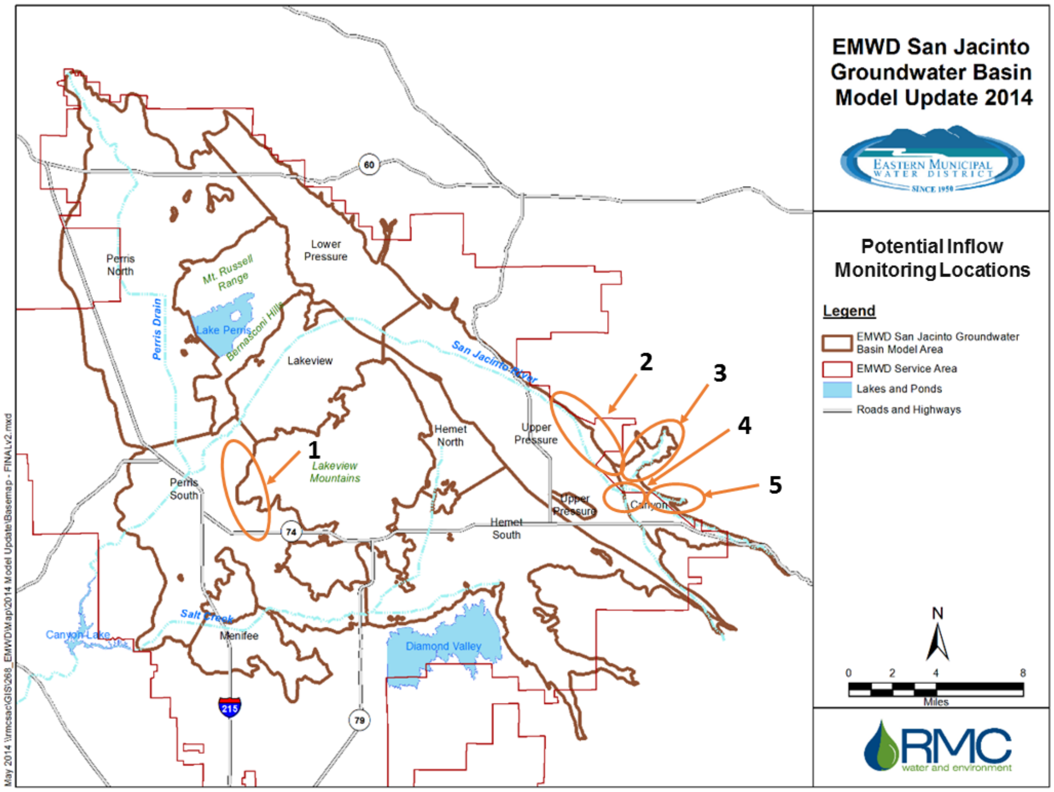

Figure 121: Hemet-San Jacinto Management Areas Considered for Improved Inflow Data

Table 42: Description of Improved Inflow Data Locations

Area Number	Description
West San Jacinto Management Area	
1	Area with high mountain front recharge flows from Lakeview Mountains flowing to Perris South GMZ.
Hemet-San Jacinto Management Area	
2	Area with high mountain front recharge flows to Intake area
3	Poppet Creek – tributary to the San Jacinto River recharges the aquifer near the main groundwater extraction zone in Canyon
4	Boundary of Upper Pressure and Canyon where San Jacinto River intersects the leaky fault between Canyon and Upper Pressure
5	Indian Creek – tributary to the San Jacinto River recharge the aquifer near the main groundwater extraction zone in Canyon

6.3 Stratigraphy/Geology Data Updates

EMWD has conducted extensive work on developing the conceptual geology of the San Jacinto Groundwater Basin. This work includes development of 33 detailed cross sections that cover GMZs in the San Jacinto Groundwater Basin. These cross sections were reviewed by the modeling team and the

Advisory Panel members and were incorporated in development of the SJFM-2014 Model layers and groundwater flow system. During the calibration process five model areas were identified that could benefit from additional hydrogeologic data for improved estimation of model layer thicknesses and model constructs in the following GMZs:

- Canyon
- Hemet North
- Lower Pressure
- Perris North
- Upper Pressure

Perris North

A significant drop in water levels is observed moving east from MARB into the central part of Perris North. This area of the basin is very shallow and only the top model layer is present. Additional hydrogeologic studies to obtain better information on the stratigraphy and groundwater flow system would allow for more accurate simulation of water levels flowing to the central part of the GMZ.

Lower Pressure

Hydrogeologic conditions in the Lower Pressure are very complex and data is sparse. Additional hydrogeologic studies would improve calibration of water levels in this GMZ.

Hemet North

The large drop in observed water levels in the central section of Hemet North was simulated using zones of low horizontal hydraulic conductivity. Additional hydrogeologic studies in this area would improve understanding of the groundwater flow system and allow for more accurate simulation of water levels. This will result in improved estimation of regional flows from Hemet South to Lakeview.

Upper Pressure

The LP-UP construct was used in the SJFM-2014 to simulate the groundwater depression recorded in historical water levels of the southern Lower Pressure and northern Upper Pressure. This area of Upper Pressure is where the clay cap is thickest. Hydrogeologic studies to obtain additional layering information around the LP-UP construct would allow for more accurate simulation of water levels in the northern portion of Upper Pressure.

Canyon

The location and shape of the bedrock underlying Canyon is not clearly defined. In development of the SJFM-2014 Model, two Canyon model constructs were added to simulate the changes in observed water levels throughout this GMZ. Conducting additional hydrogeologic studies in Canyon would allow more accurate simulation of water levels.

6.4 Water Quality Model Update

The SJFTM-2002 included a water quality component that was not part of the SJFM-2014 update. It is recommended that the water quality component of the model be updated to allow for use of the model in management of water quality issues in the San Jacinto Groundwater Basin such as migration of high TDS groundwater from Perris South GMZ to the neighboring areas. The water quality model can be specific to total dissolved solids (TDS) and nitrate, both of which have historically high concentrations in the Basin.

While the SJFM-2014 Model does not currently include water quality modeling capabilities, it provides the fundamental data and framework as well as appropriate level of spatial and temporal details for future water quality model development, including simulation of transport of TDS and nitrate.

6.5 Advisory Panel Recommendations

Technical appropriateness, credibility, and defensibility of SJFM-2014 Model have been reviewed by EMWD staff, the Advisory Panel, and the Hemet-San Jacinto Watermaster Advisor via six technical review workshops. Reviewers' comments were incorporated in the development of the model. Details of these workshops, including the agenda, summary, and action items, are provided in Appendix F.

Following completion of SJFM-2014 Model calibration, a questionnaire was prepared and provided to all AP members regarding the status of calibration and recommendations for future refinements and updates of the SJFM-2014 Model. The following is a list of the main questions included in the questionnaire:

- Provide comments on the conceptual model and its applicability for development of the numerical model.
- Provide any recommendations for future refinement and updates.
- Provide comments on the adequacy of approach and methodology for calibration of the numerical model.
- Provide comments on the model calibration results as intended for application of the model to the estimation of basin yield, and suitability for predictive scenario runs.

Responses by AP members to the questionnaire and EMWD/RMC response to AP comments are provided in Appendix F. In general, AP members agree that the conceptual model is appropriate for development of the groundwater flow model for the San Jacinto Groundwater Basis. The general calibration approach and goals were generally accepted by the AP members. Additional statistics of model calibration were recommended by AP which are now included in the final report. Final calibration results were reviewed by the AP members and general consensus exists that the model is suitable for predictive scenario runs in major existing or planned groundwater production areas. As indicated in Sections 6.2 and 6.3, there are areas of complex hydrological conditions in the model area that represent some lack of data to provide reasonable understanding of the groundwater conditions. AP recommendations is to consider these complexities when interpreting the future simulation results.

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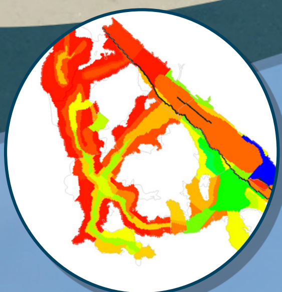
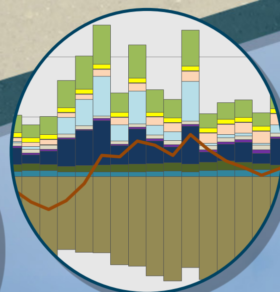
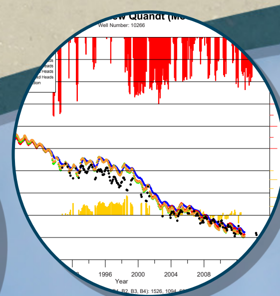
Hemet-San Jacinto Watermaster

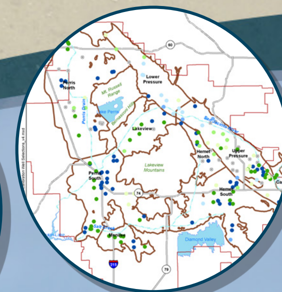
EASTERN MUNICIPAL WATER DISTRICT
SINCE 1950

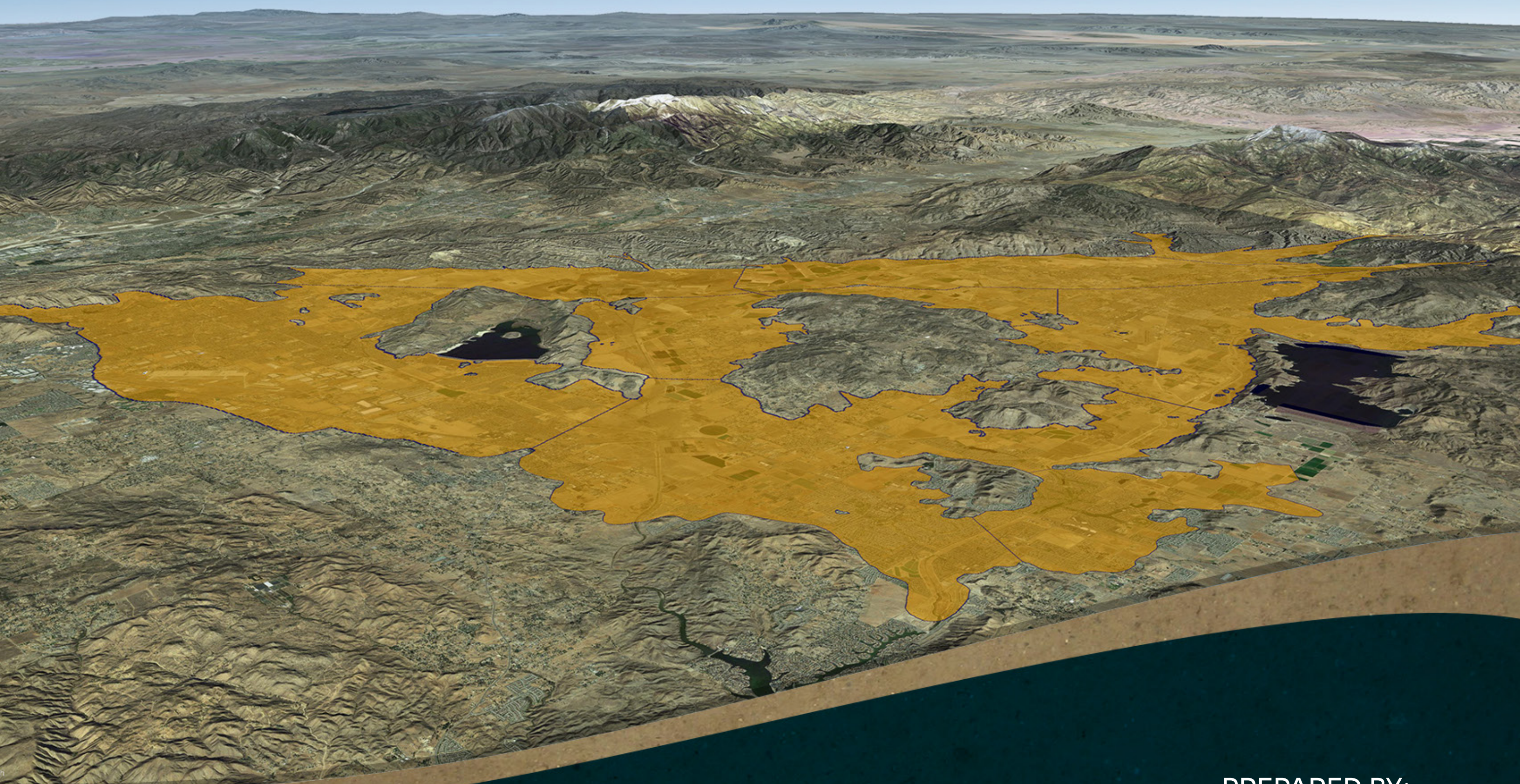
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92570







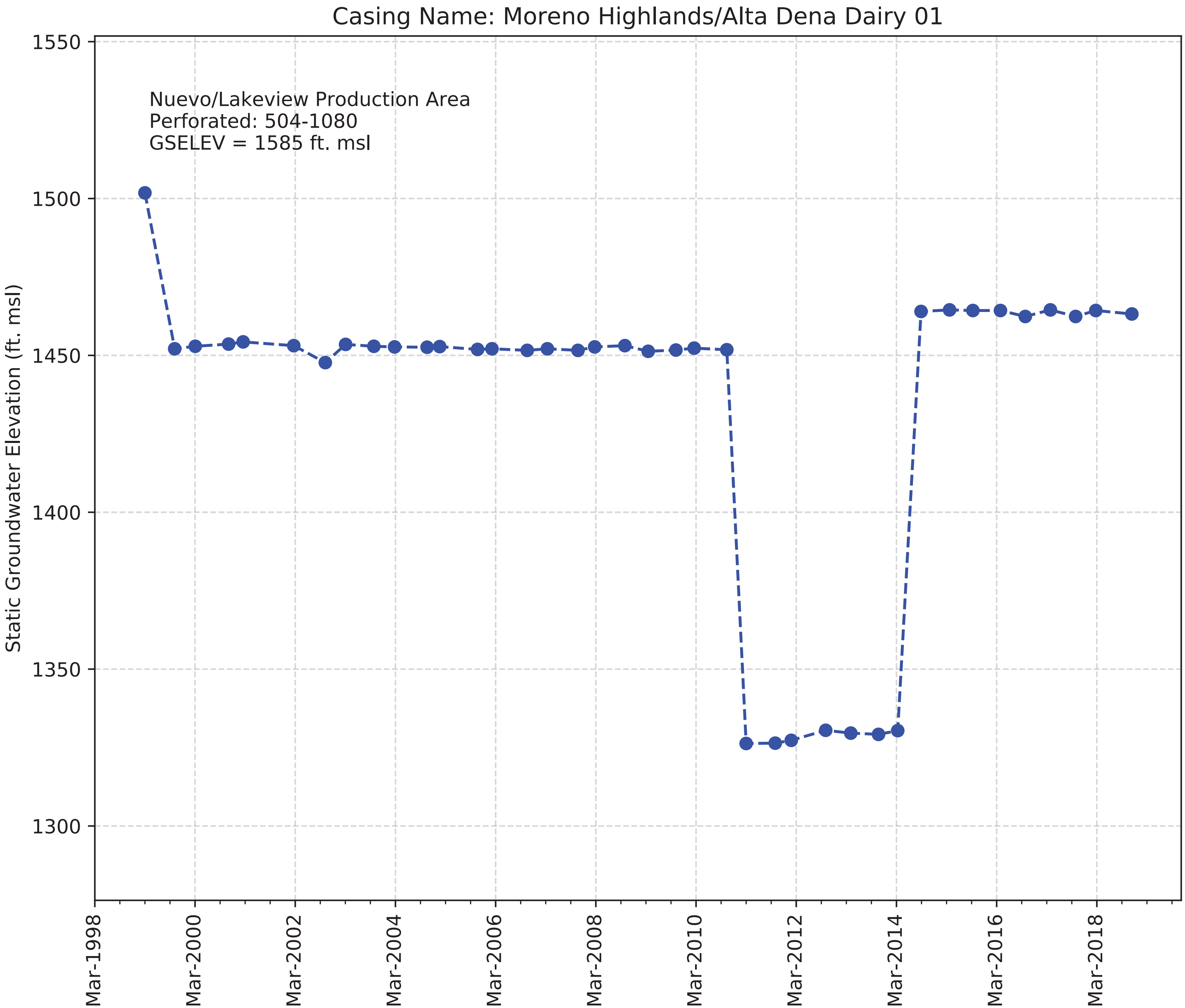


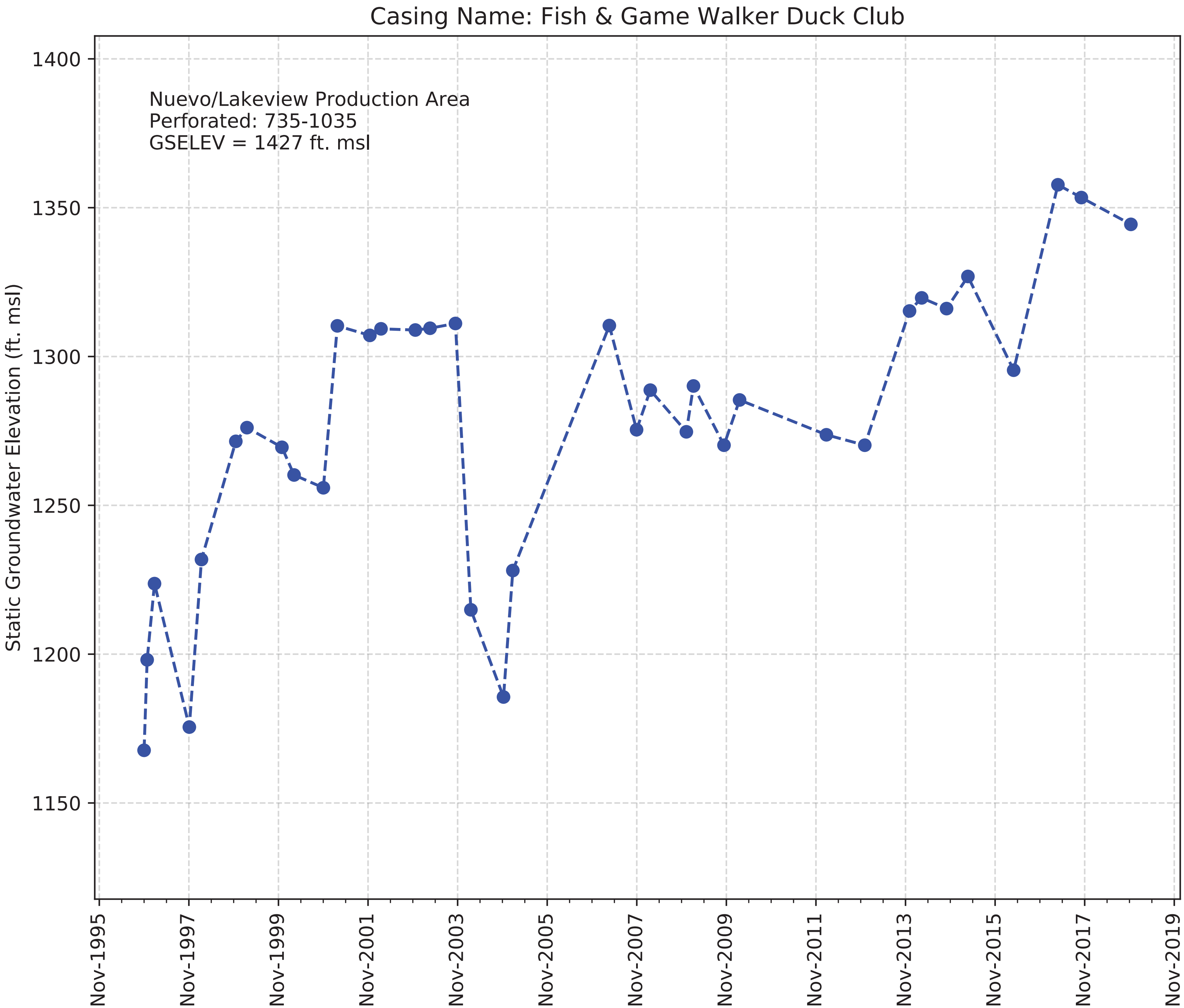


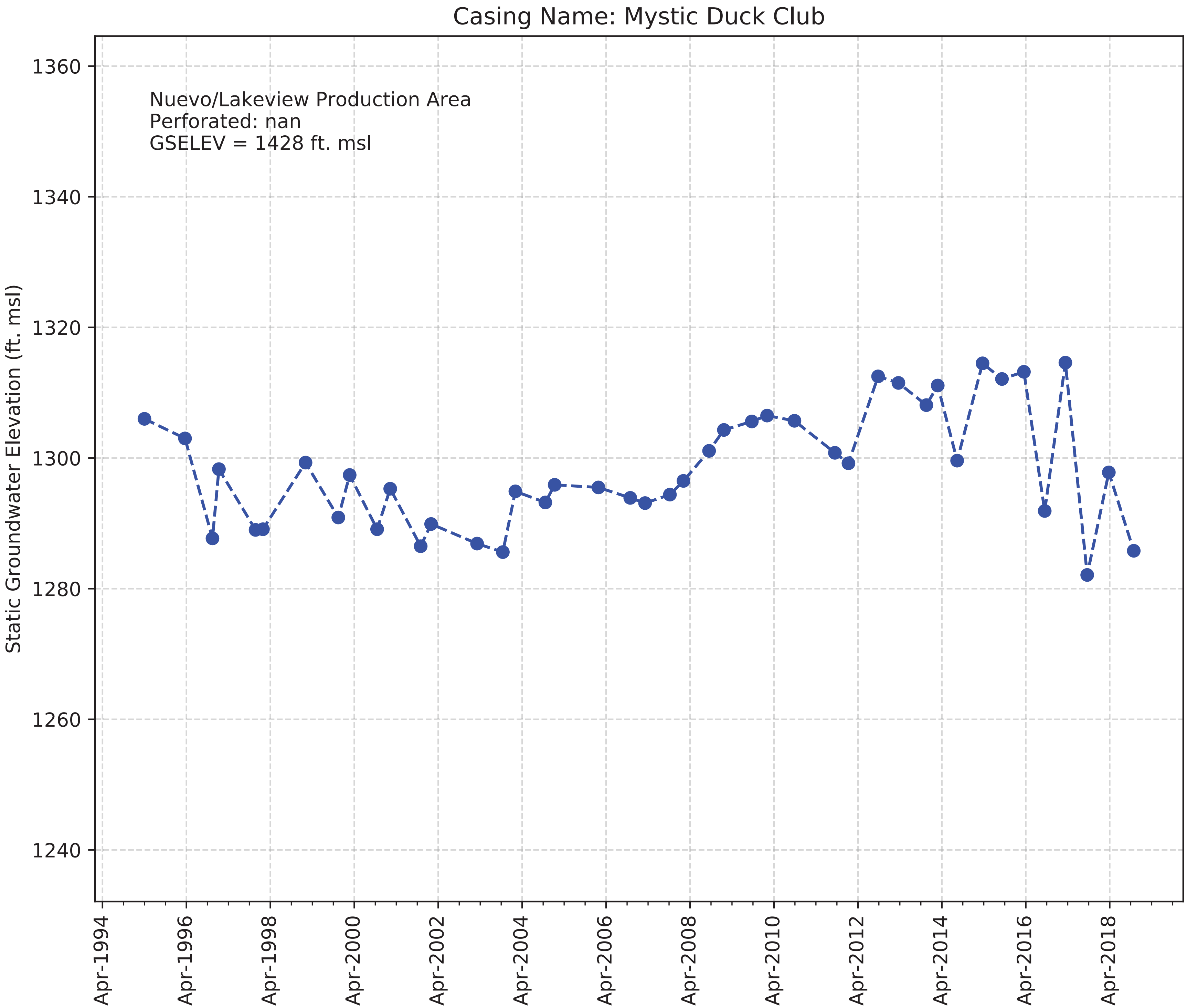
PREPARED BY:
RMC
water and environment

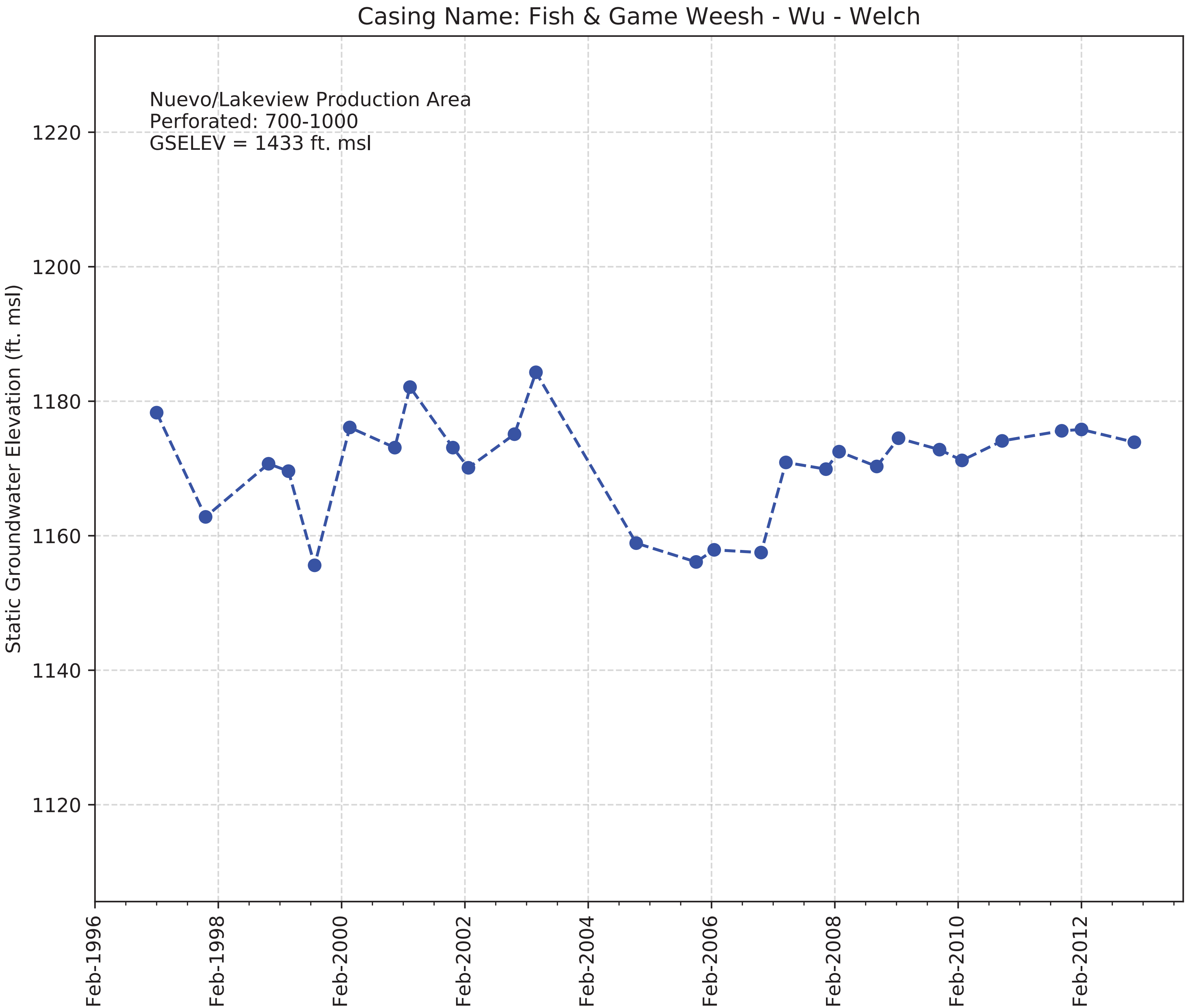
APPENDIX H

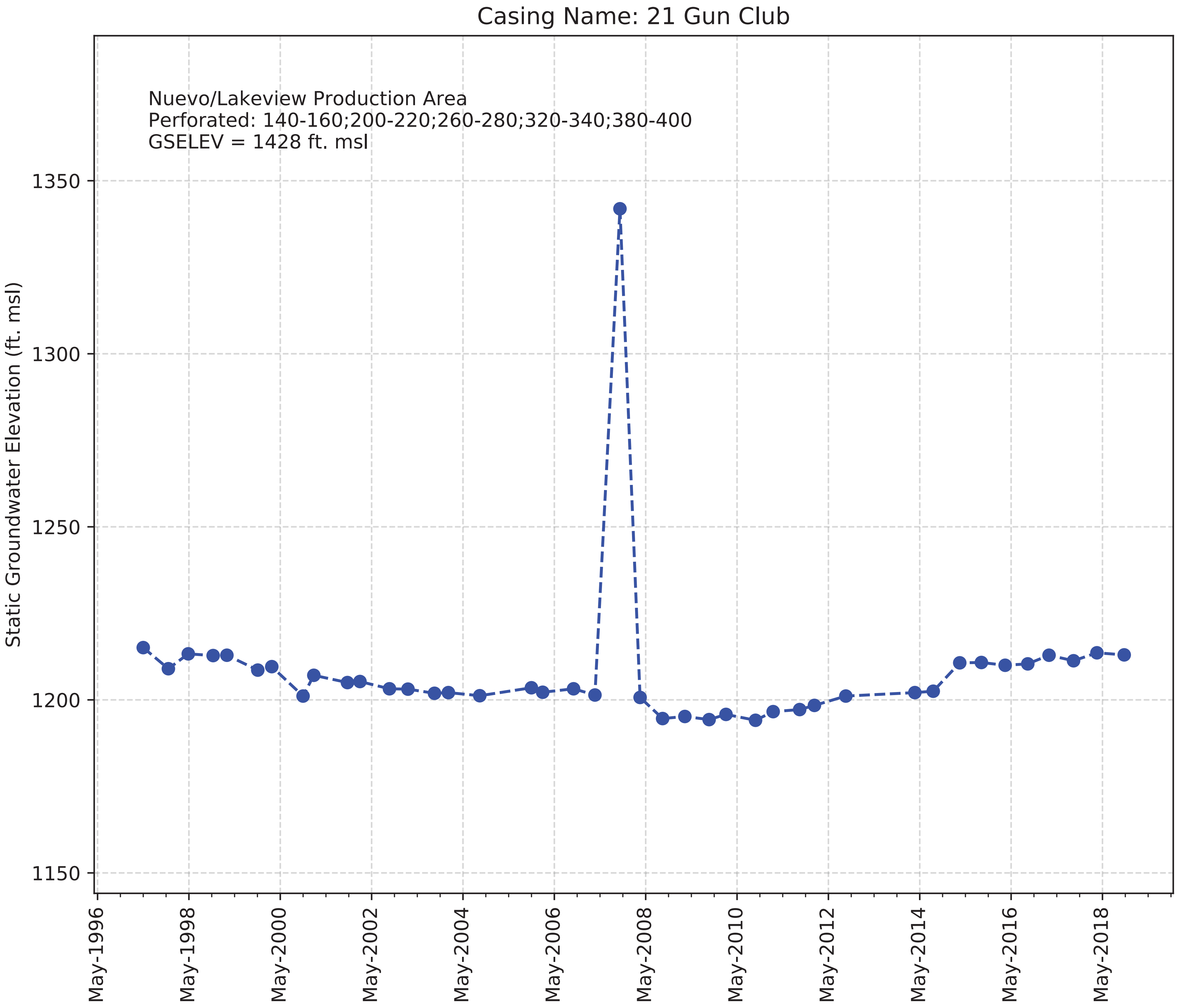
Groundwater Elevation Hydrographs

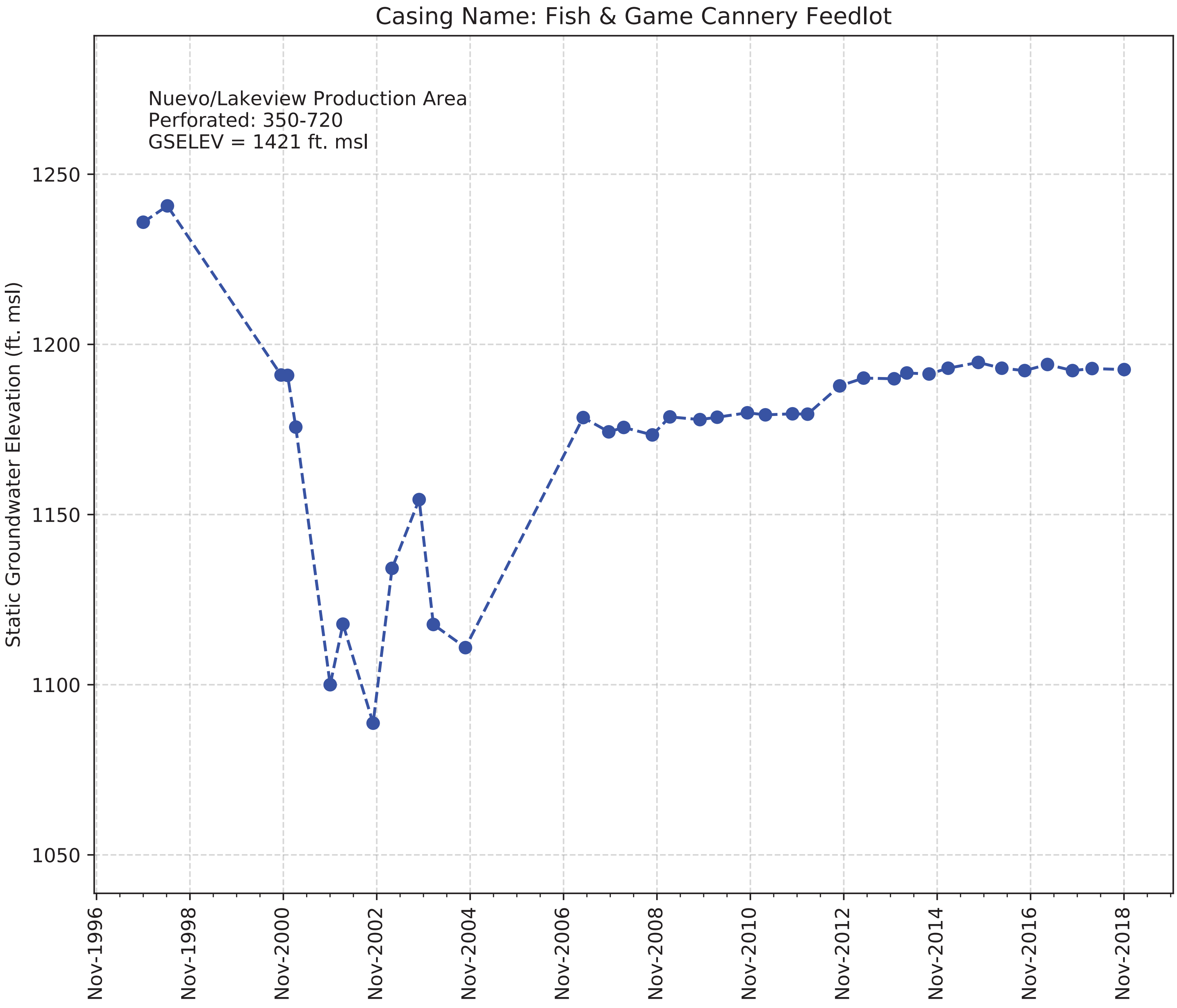

Casing Name: Moreno Highlands/Alta Dena Dairy 01
Nuevo/Lakeview Production Area
Perforated: 504-1080
GSELEV = 1585 ft. msl
Static Groundwater Elevation (ft. msl)
1550
1500
1450
1400
1350
1300
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

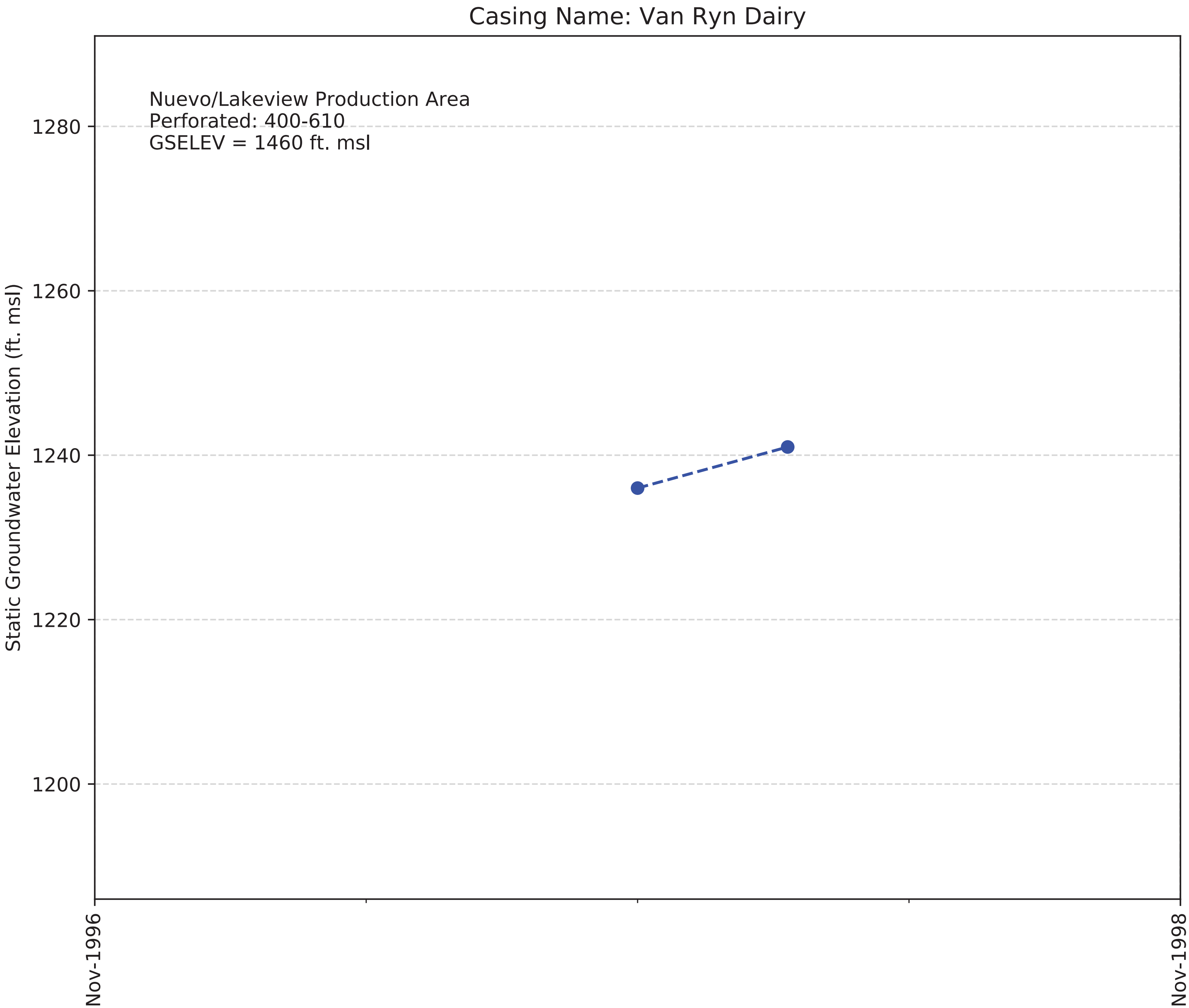

Casing Name: Fish & Game Walker Duck Club
Nuevo/Lakeview Production Area
Perforated: 735-1035
GSELEV = 1427 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1350
1300
1250
1200
1150
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017
Nov-2019

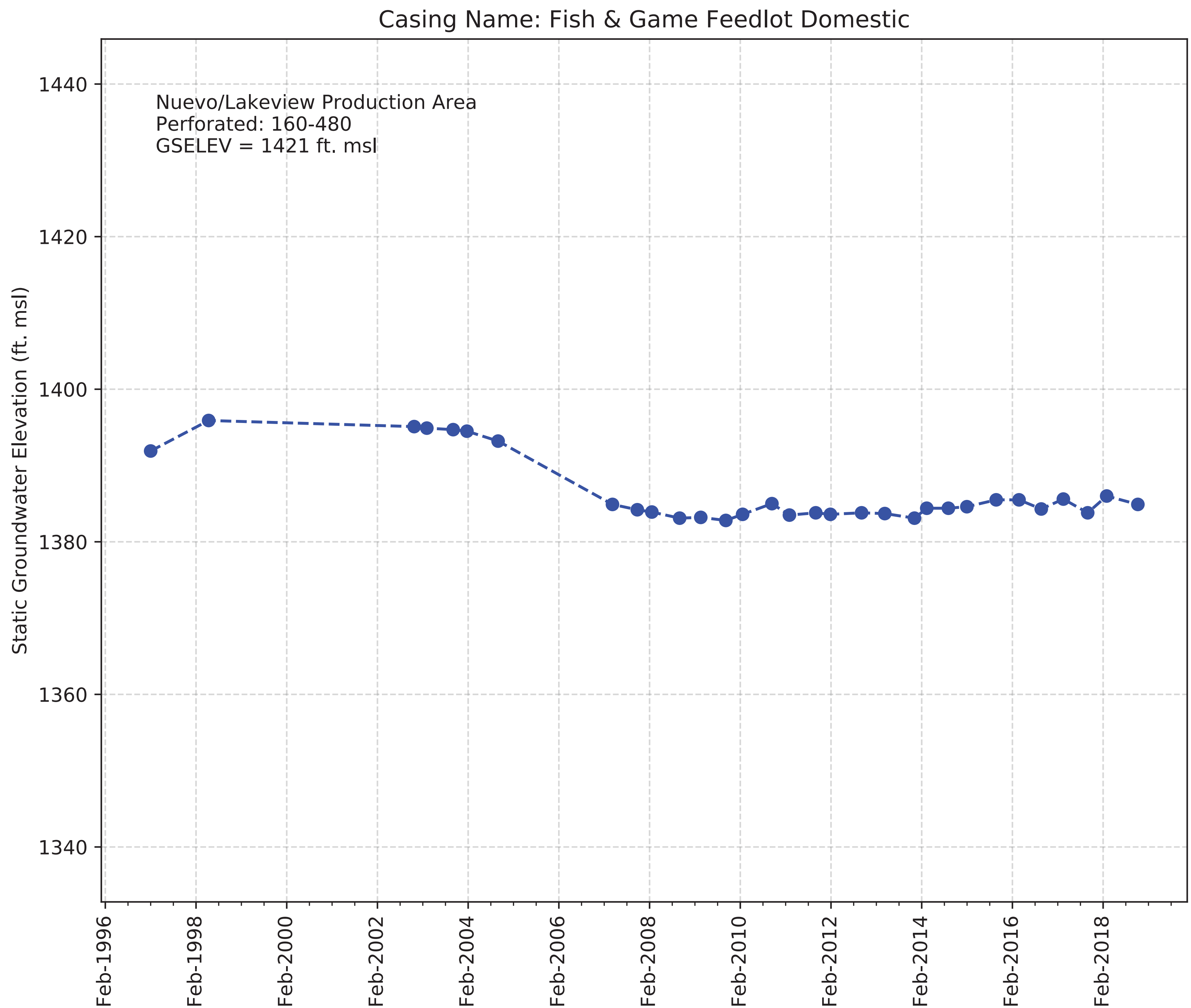

Casing Name: Mystic Duck Club
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1360
1340
1320
1300
1280
1260
1240
Apr-1994
Apr-1996
Apr-1998
Apr-2000
Apr-2002
Apr-2004
Apr-2006
Apr-2008
Apr-2010
Apr-2012
Apr-2014
Apr-2016
Apr-2018

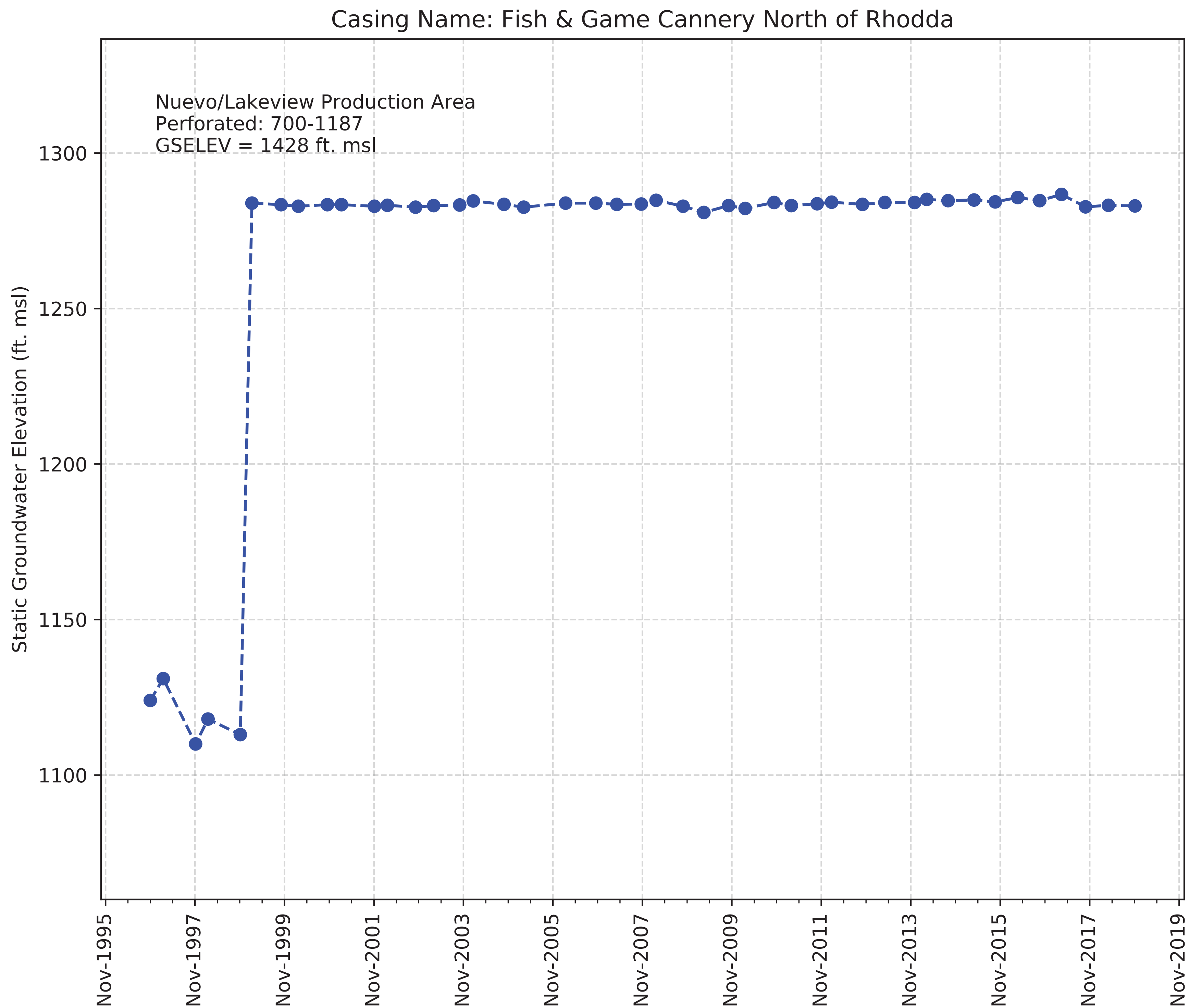

Casing Name: Fish & Game Weesh - Wu - Welch
Nuevo/Lakeview Production Area
Perforated: 700-1000
GSELEV = 1433 ft. msl
Static Groundwater Elevation (ft. msl)
1220
1200
1180
1160
1140
1120
Feb-1996
Feb-1998
Feb-2000
Feb-2002
Feb-2004
Feb-2006
Feb-2008
Feb-2010
Feb-2012

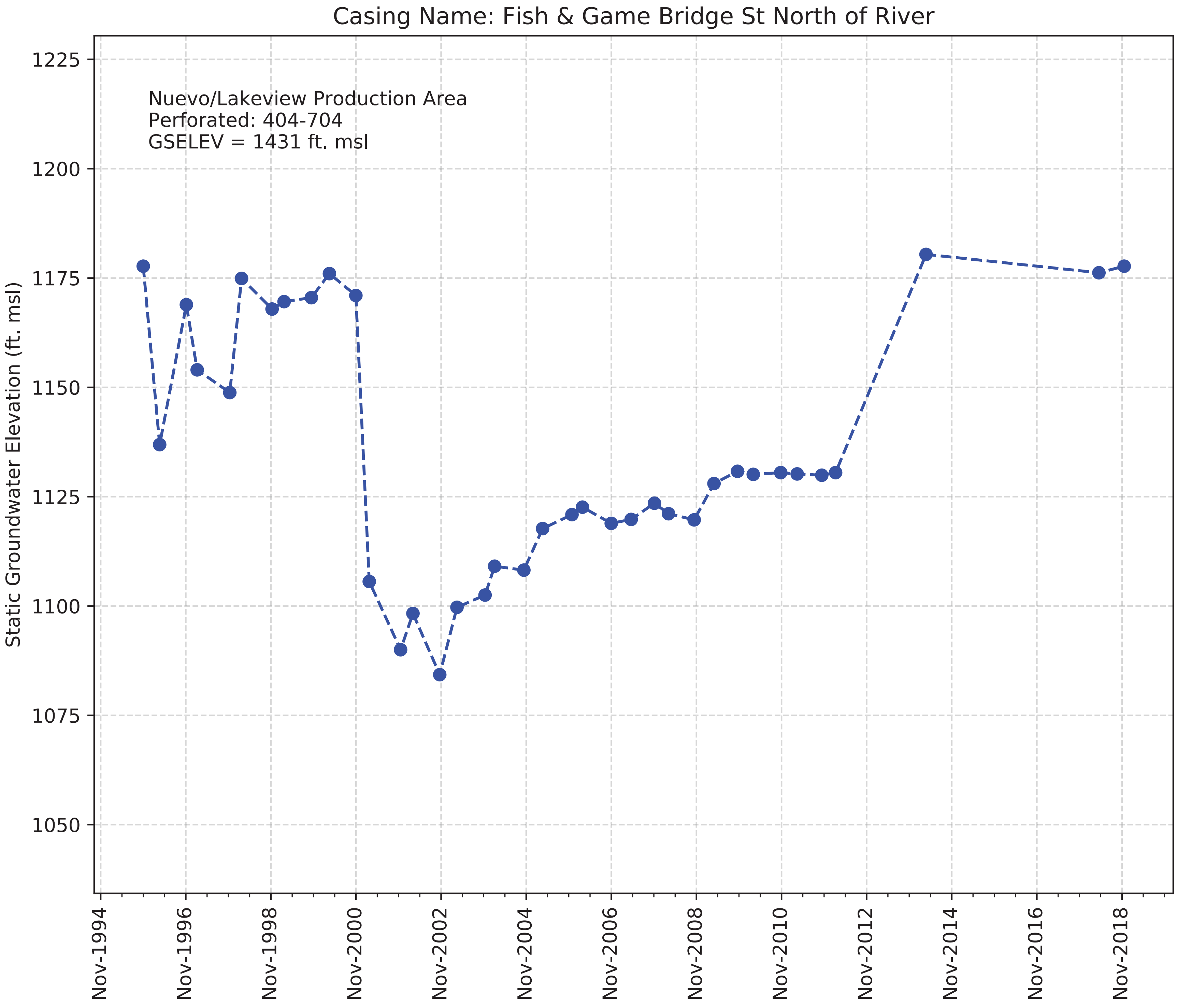

Casing Name: 21 Gun Club
Nuevo/Lakeview Production Area
Perforated: 140-160;200-220;260-280;320-340;380-400
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1350
1300
1250
1200
1150
May-1996
May-1998
May-2000
May-2002
May-2004
May-2006
May-2008
May-2010
May-2012
May-2014
May-2016
May-2018

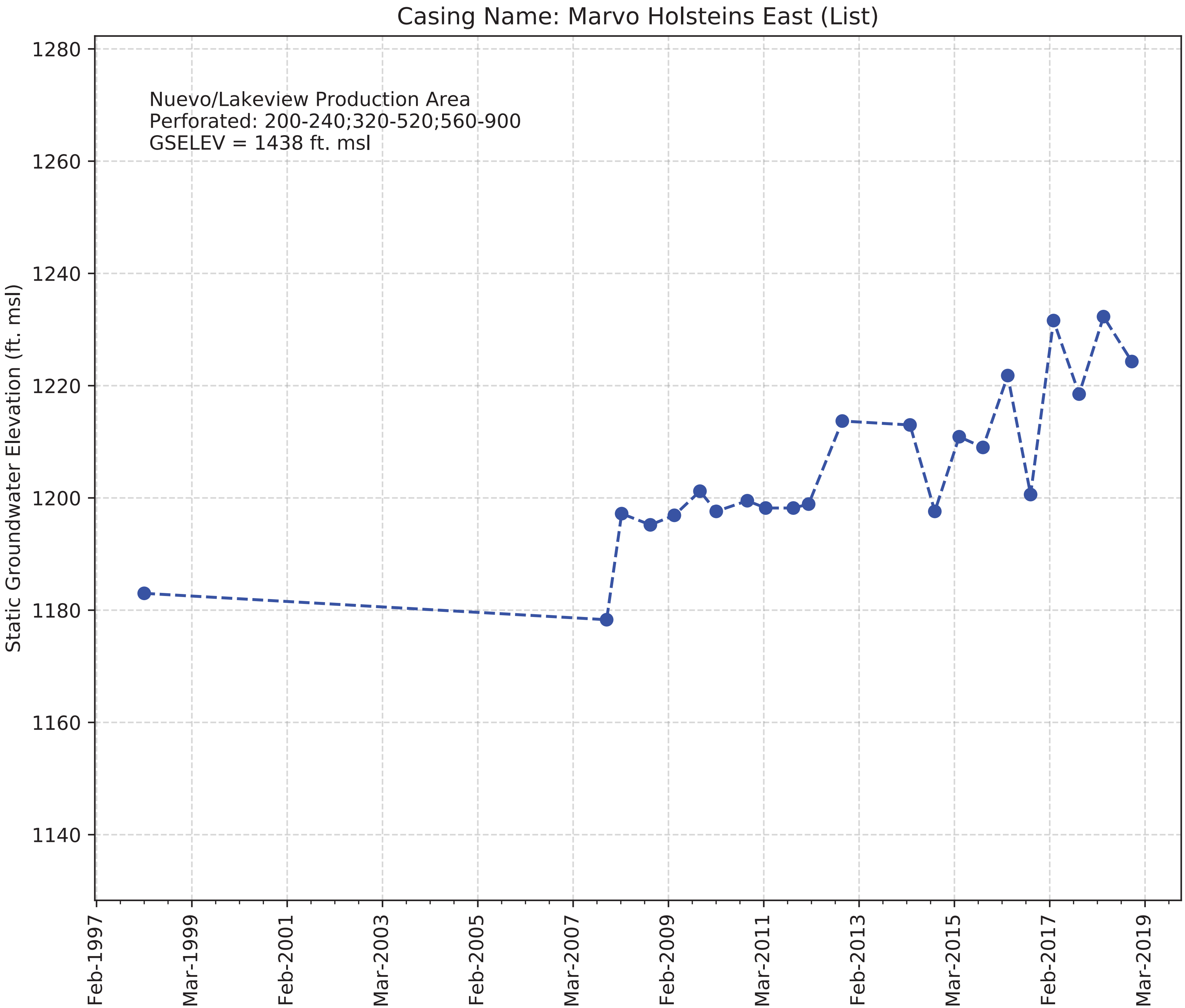

Casing Name: Fish & Game Cannery Feedlot
Nuevo/Lakeview Production Area
Perforated: 350-720
GSELEV = 1421 ft. msl
Static Groundwater Elevation (ft. msl)
1250
1200
1150
1100
1050
Nov-1996
Nov-1998
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008
Nov-2010
Nov-2012
Nov-2014
Nov-2016
Nov-2018

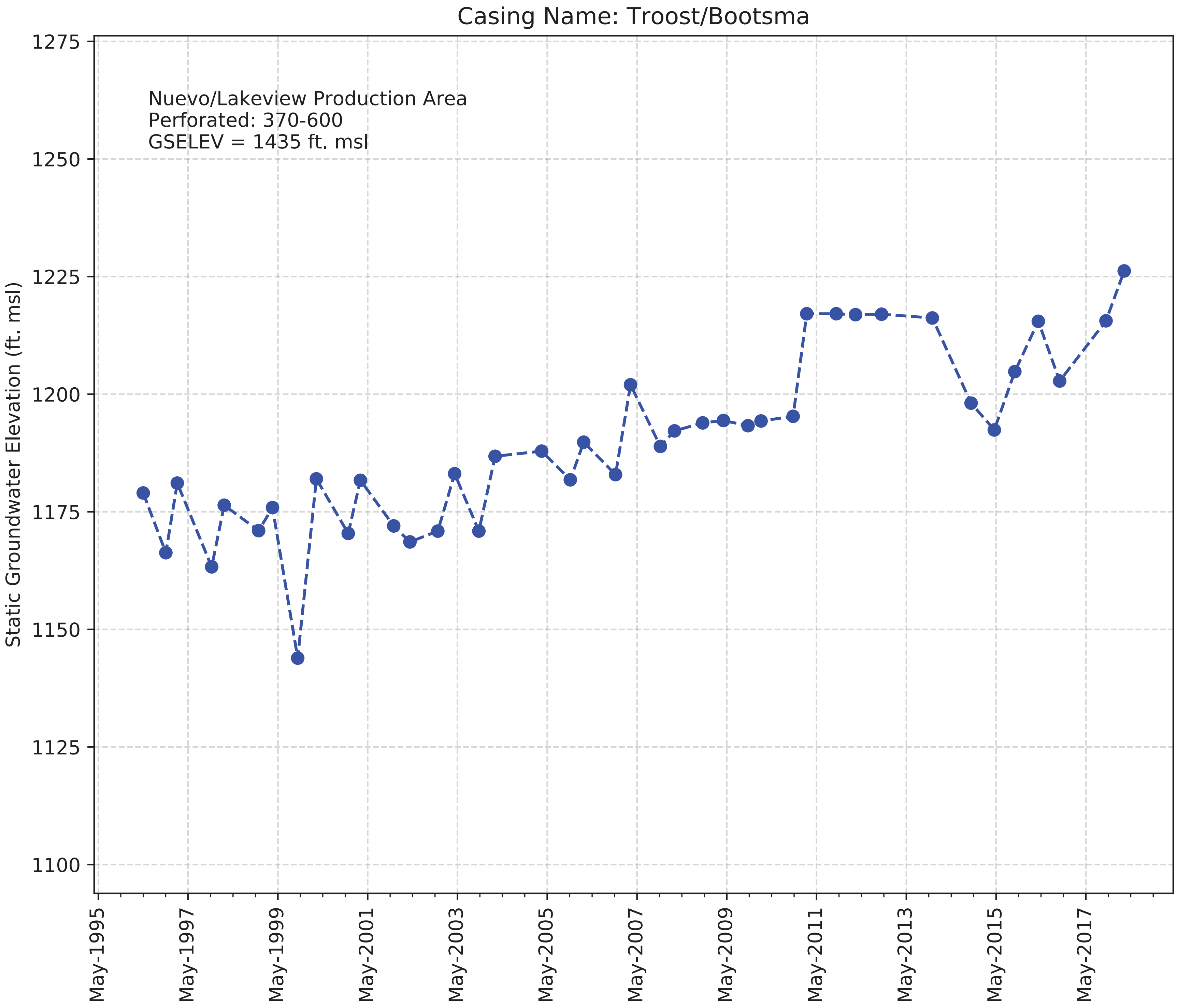

Casing Name: Van Ryn Dairy
Nuevo/Lakeview Production Area
Perforated: 400-610
GSELEV = 1460 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
Nov-1996
Nov-1998

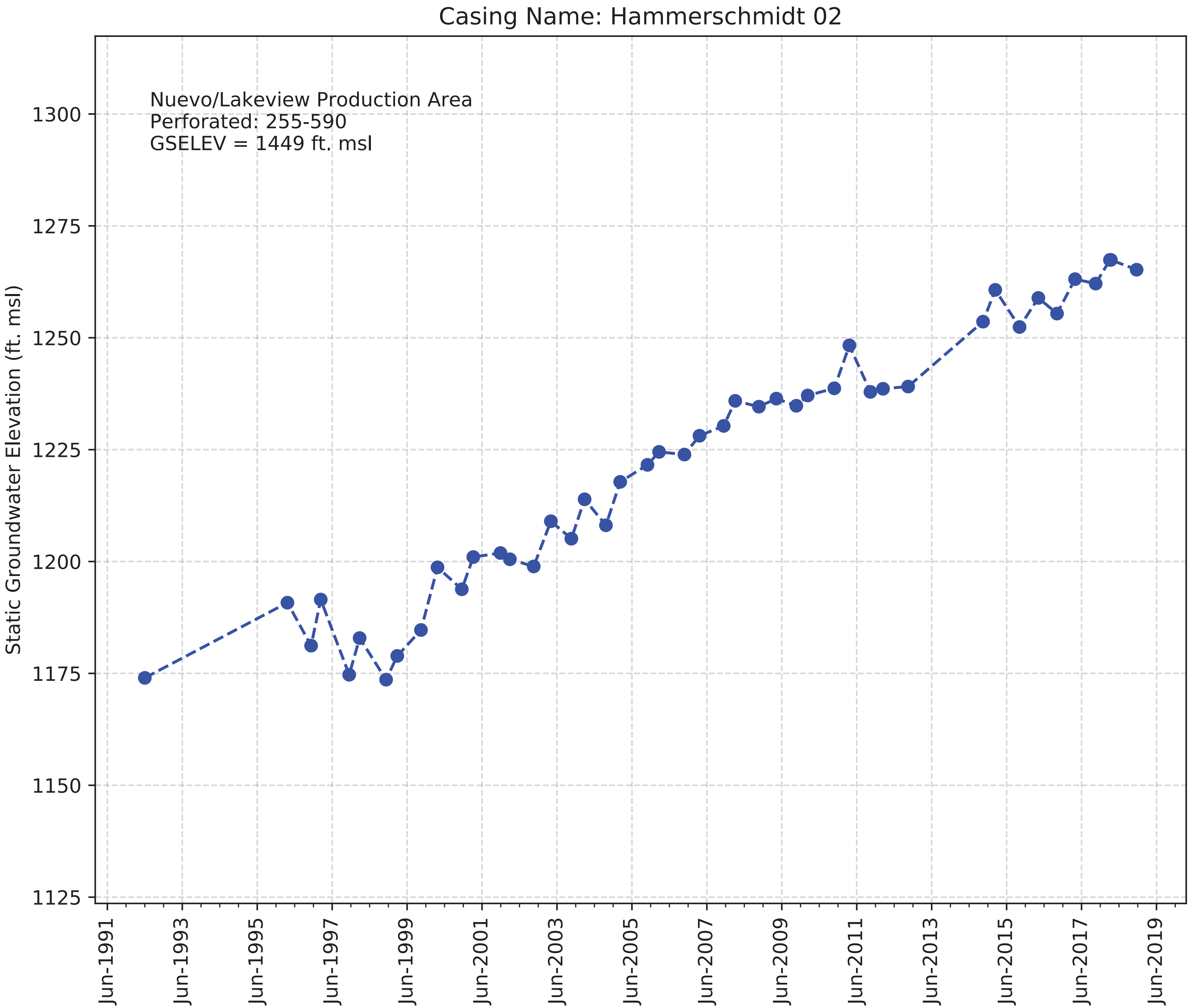

Casing Name: Fish & Game Feedlot Domestic
Nuevo/Lakeview Production Area
Perforated: 160-480
GSELEV = 1421 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Feb-1996
Feb-1998
Feb-2000
Feb-2002
Feb-2004
Feb-2006
Feb-2008
Feb-2010
Feb-2012
Feb-2014
Feb-2016
Feb-2018

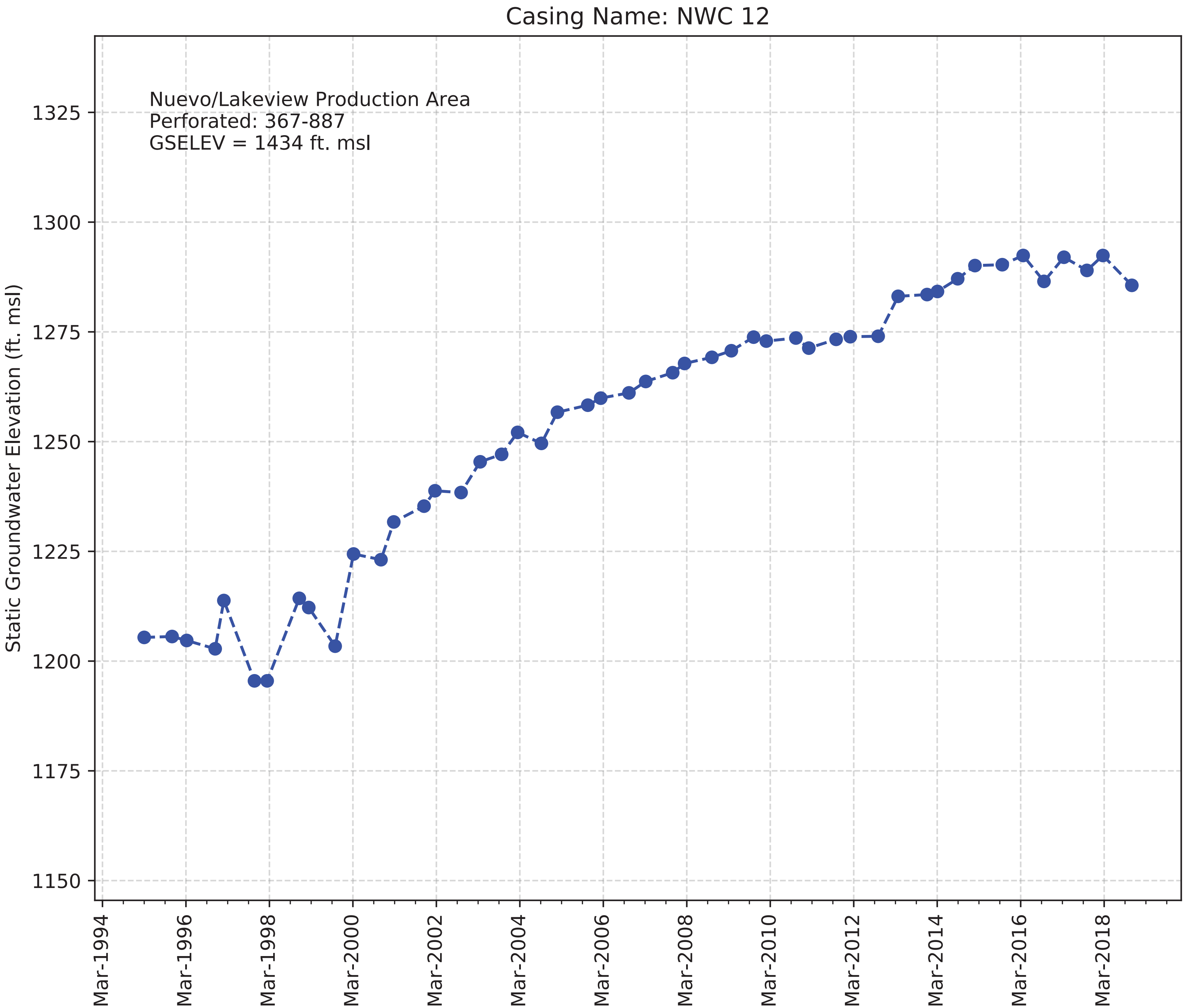

Casing Name: Fish & Game Cannery North of Rhodda
Nuevo/Lakeview Production Area
Perforated: 700-1187
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1250
1200
1150
1100
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017
Nov-2019

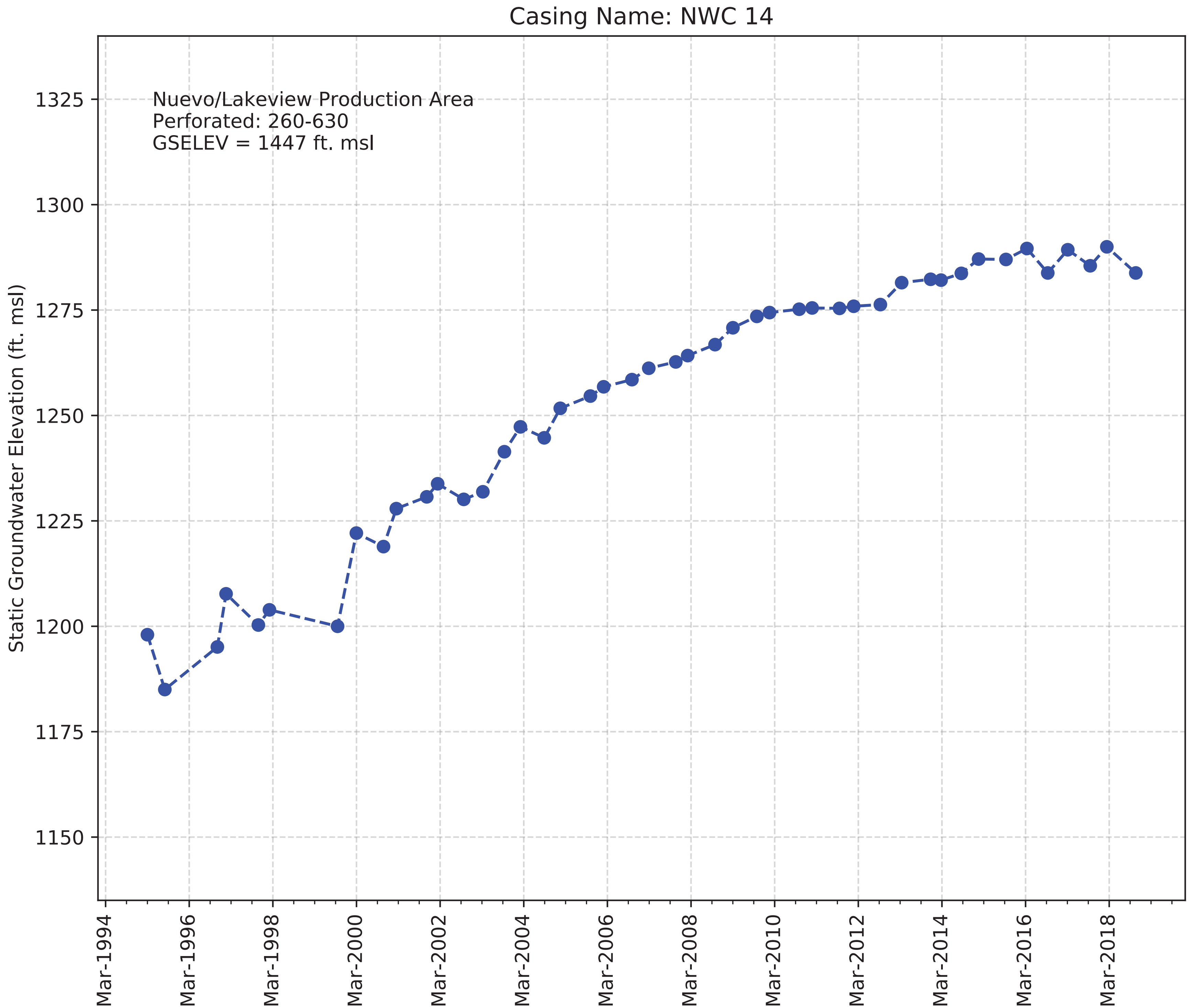

Casing Name: Fish & Game Bridge St North of River
Nuevo/Lakeview Production Area
Perforated: 404-704
GSELEV = 1431 ft. msl
Static Groundwater Elevation (ft. msl)
1225
1200
1175
1150
1125
1100
1075
1050
Nov-1994
Nov-1996
Nov-1998
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008
Nov-2010
Nov-2012
Nov-2014
Nov-2016
Nov-2018

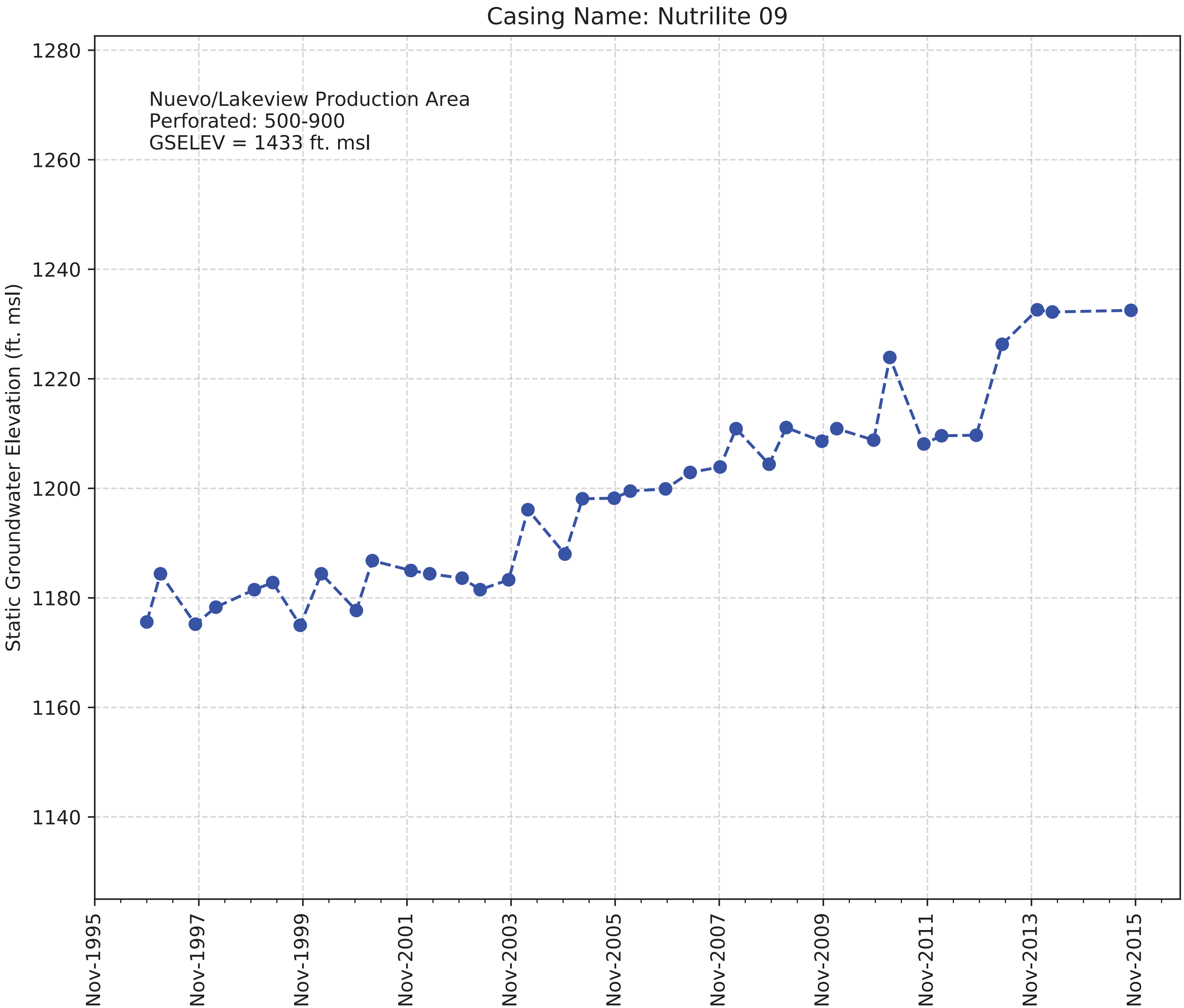

Casing Name: Marvo Holsteins East (List)
Nuevo/Lakeview Production Area
Perforated: 200-240;320-520;560-900
GSELEV = 1438 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
1180
1160
1140
Feb-1997
Mar-1999
Feb-2001
Mar-2003
Feb-2005
Mar-2007
Feb-2009
Mar-2011
Feb-2013
Mar-2015
Feb-2017
Mar-2019

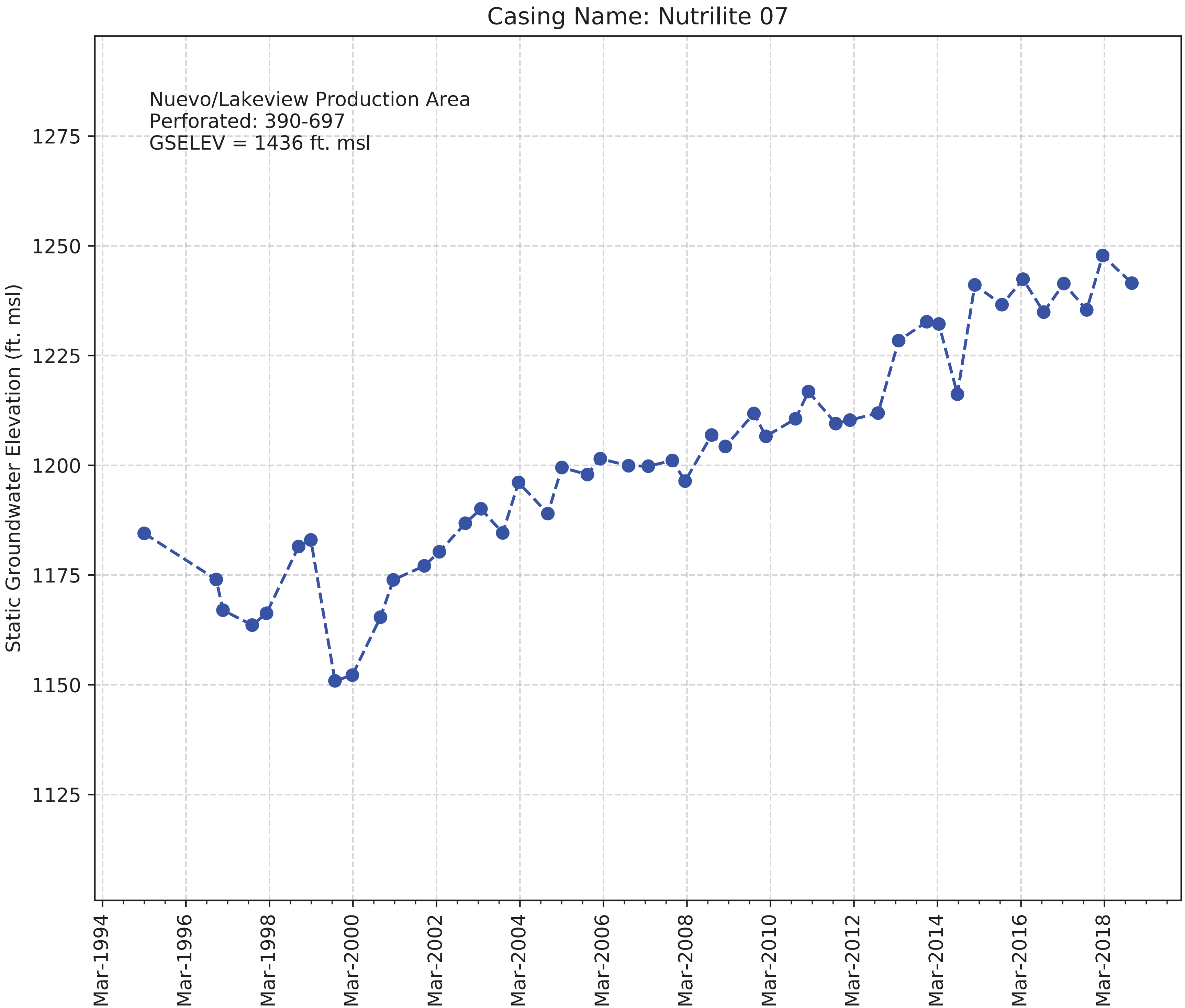

Casing Name: Troost/Bootsma
Nuevo/Lakeview Production Area
Perforated: 370-600
GSELEV = 1435 ft. msl
Static Groundwater Elevation (ft. msl)
1275
1250
1225
1200
1175
1150
1125
1100
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007
May-2009
May-2011
May-2013
May-2015
May-2017

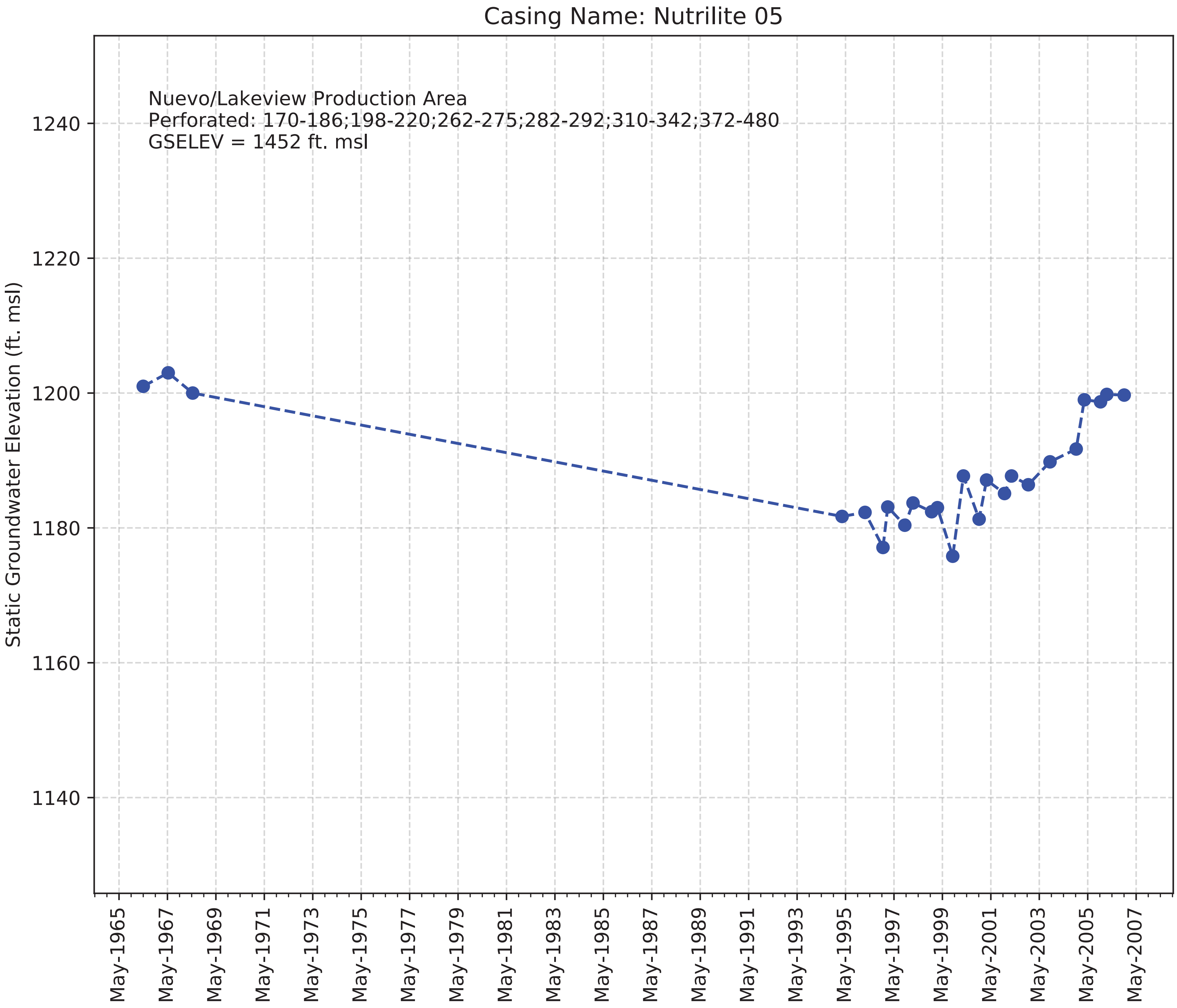

Casing Name: Hammerschmidt 02
Nuevo/Lakeview Production Area
Perforated: 255-590
GSELEV = 1449 ft. msl
Static Groundwater Elevation (ft. msl)
1125
1150
1175
1200
1225
1250
1275
1300
Jun-1991
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

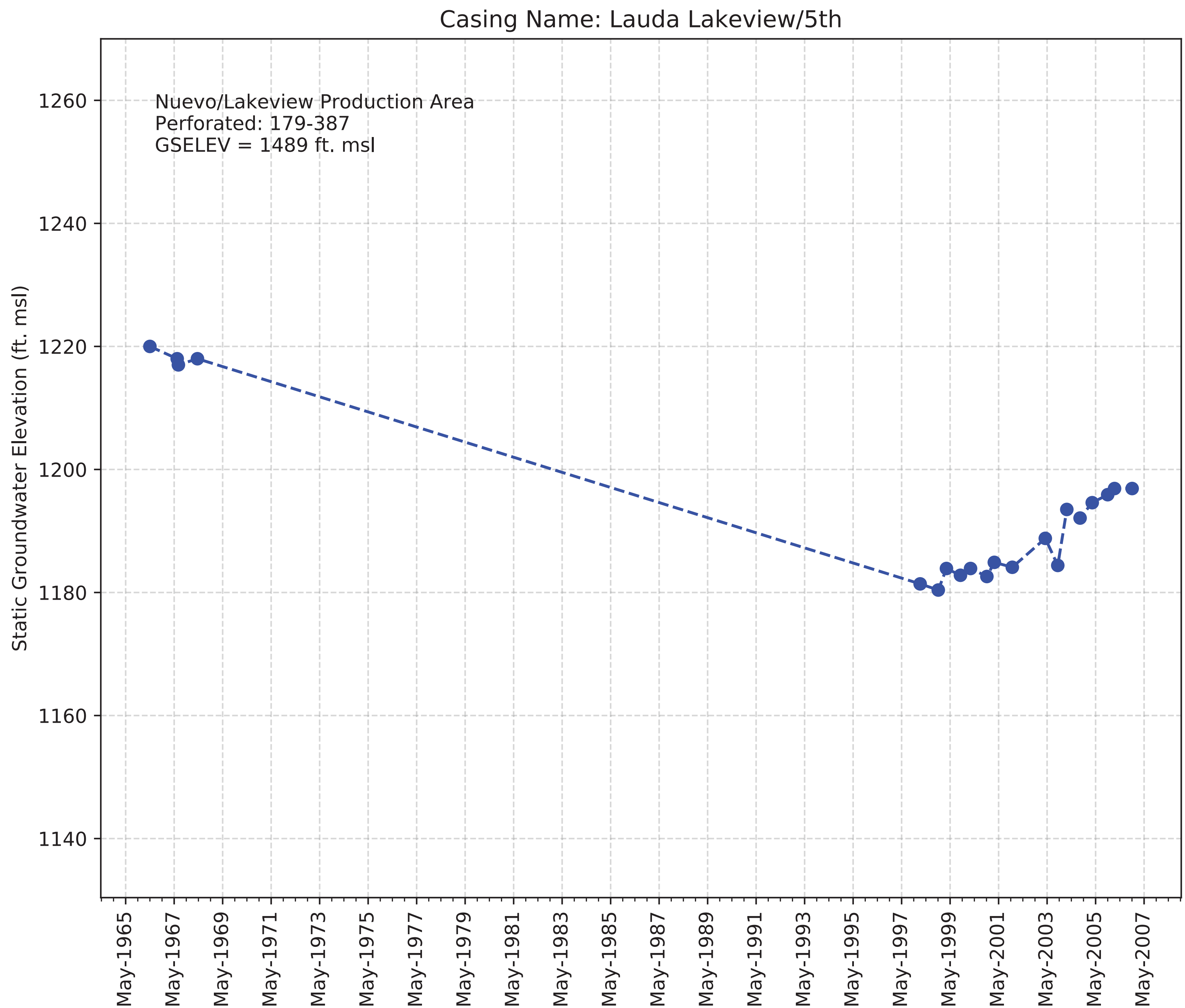

Casing Name: NWC 12
Nuevo/Lakeview Production Area
Perforated: 367-887
GSELEV = 1434 ft. msl
Static Groundwater Elevation (ft. msl)
1150
1175
1200
1225
1250
1275
1300
1325
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

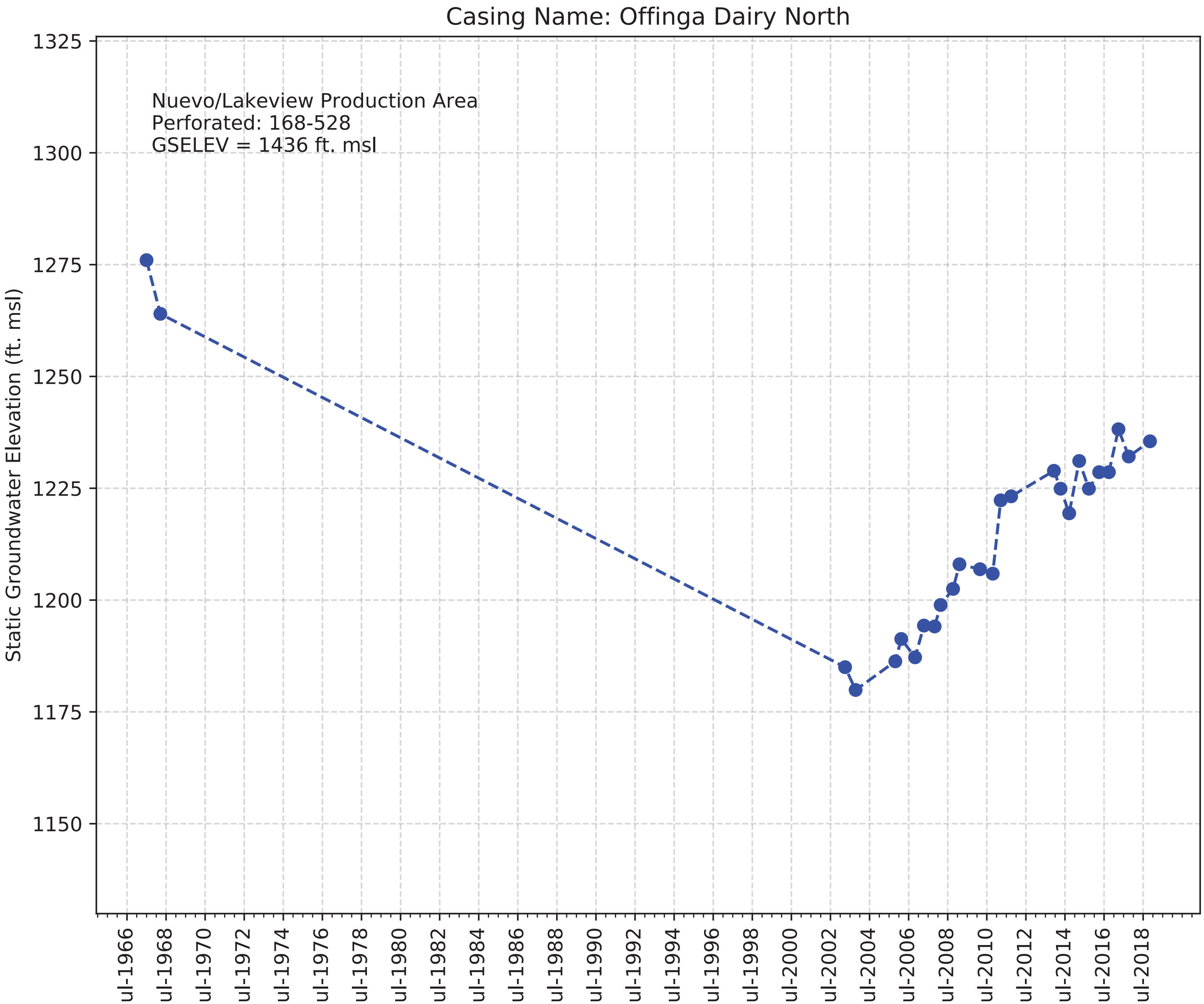

Casing Name: NWC 14
Nuevo/Lakeview Production Area
Perforated: 260-630
GSELEV = 1447 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

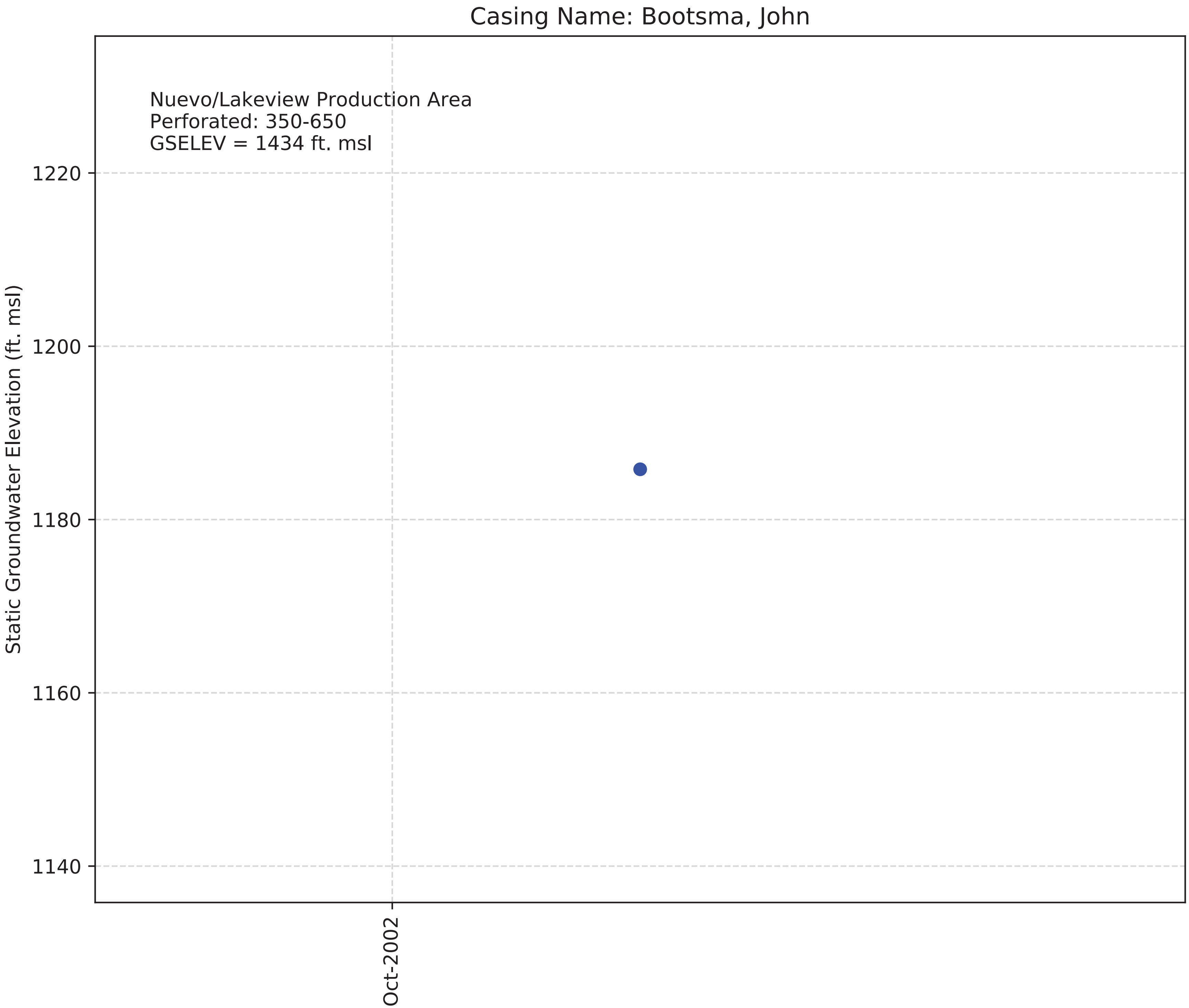

Casing Name: Nutrilite 09
Nuevo/Lakeview Production Area
Perforated: 500-900
GSELEV = 1433 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
1180
1160
1140
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015

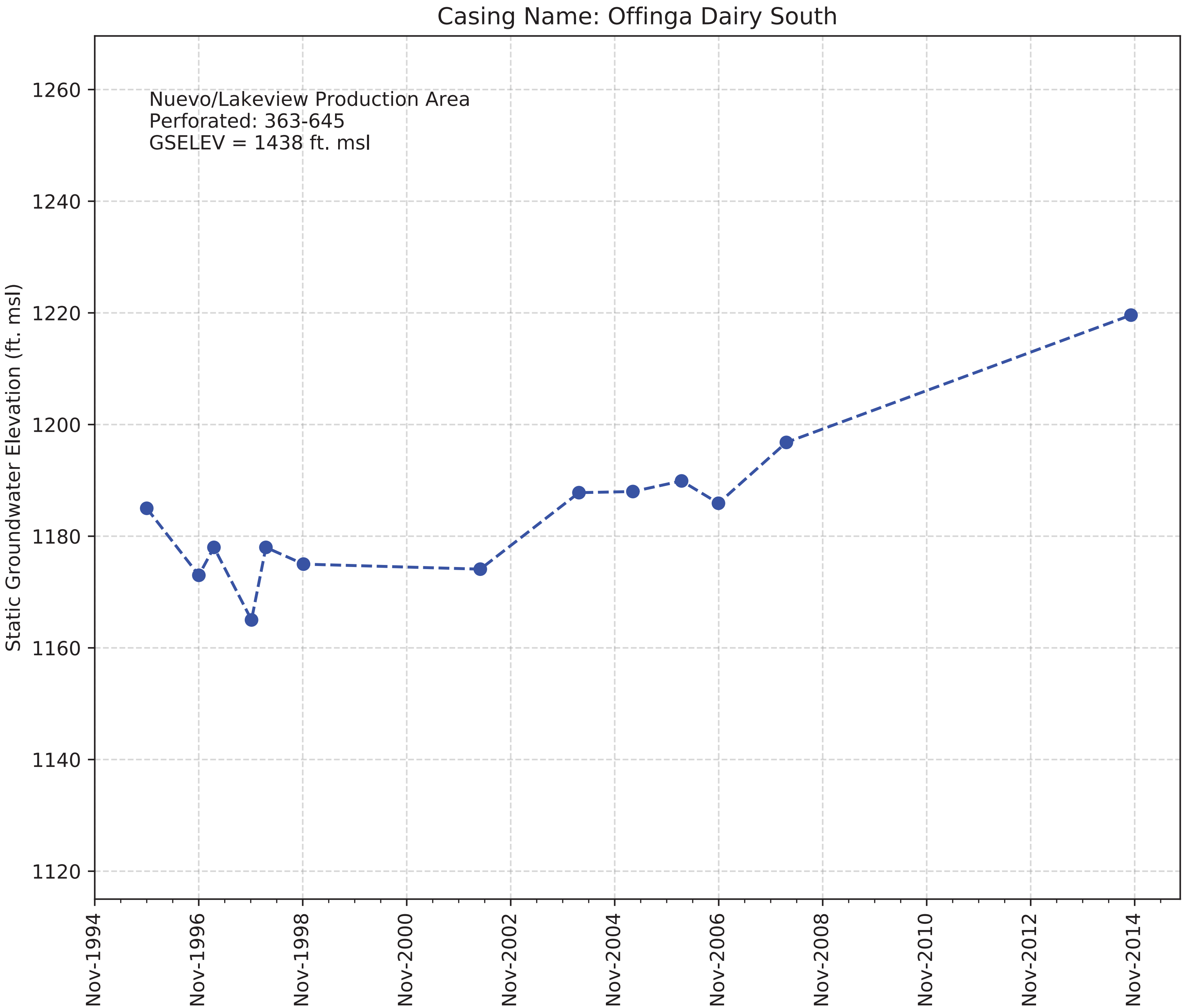

Casing Name: Nutrilite 07
Nuevo/Lakeview Production Area
Perforated: 390-697
GSELEV = 1436 ft. msl
Static Groundwater Elevation (ft. msl)
1275
1250
1225
1200
1175
1150
1125
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

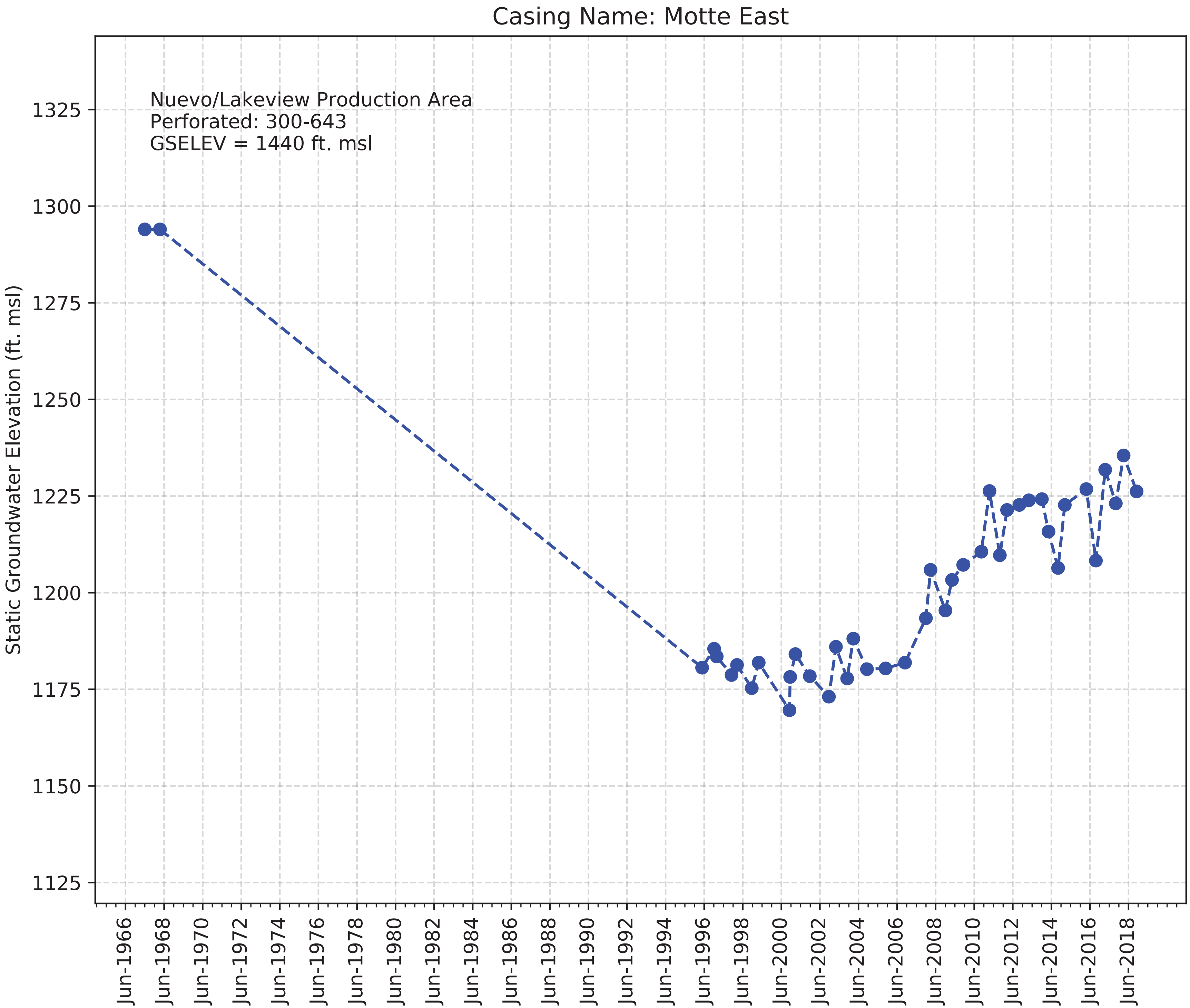

Casing Name: Nutrilite 05
Nuevo/Lakeview Production Area
Perforated: 170-186;198-220;262-275;282-292;310-342;372-480
GSELEV = 1452 ft. msl
Static Groundwater Elevation (ft. msl)
1240
1220
1200
1180
1160
1140
May-1965
May-1967
May-1969
May-1971
May-1973
May-1975
May-1977
May-1979
May-1981
May-1983
May-1985
May-1987
May-1989
May-1991
May-1993
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007

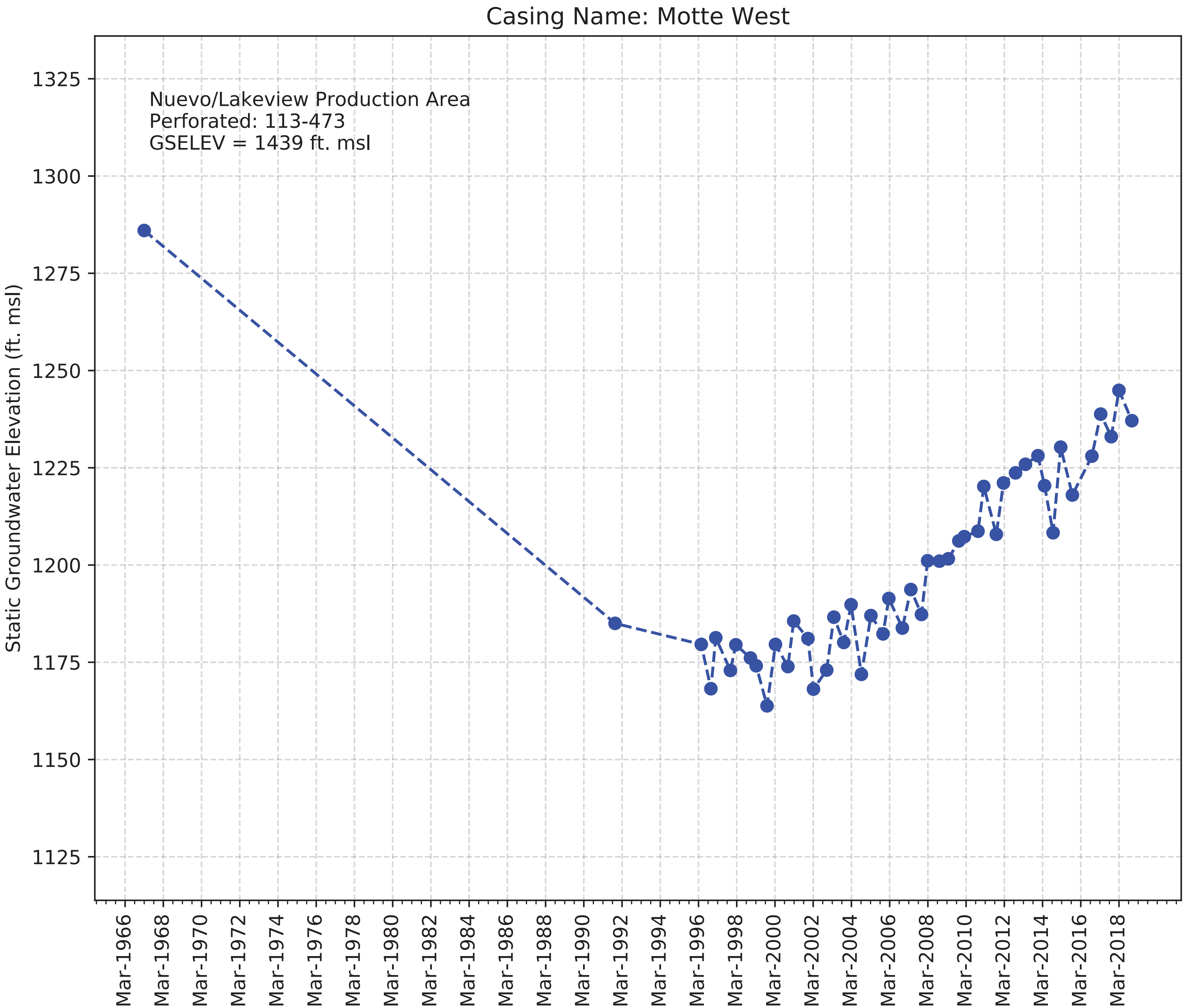

Casing Name: Lauda Lakeview/5th
Nuevo/Lakeview Production Area
Perforated: 179-387
GSELEV = 1489 ft. msl
Static Groundwater Elevation (ft. msl)
1260
1240
1220
1200
1180
1160
1140
May-1965
May-1967
May-1969
May-1971
May-1973
May-1975
May-1977
May-1979
May-1981
May-1983
May-1985
May-1987
May-1989
May-1991
May-1993
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007

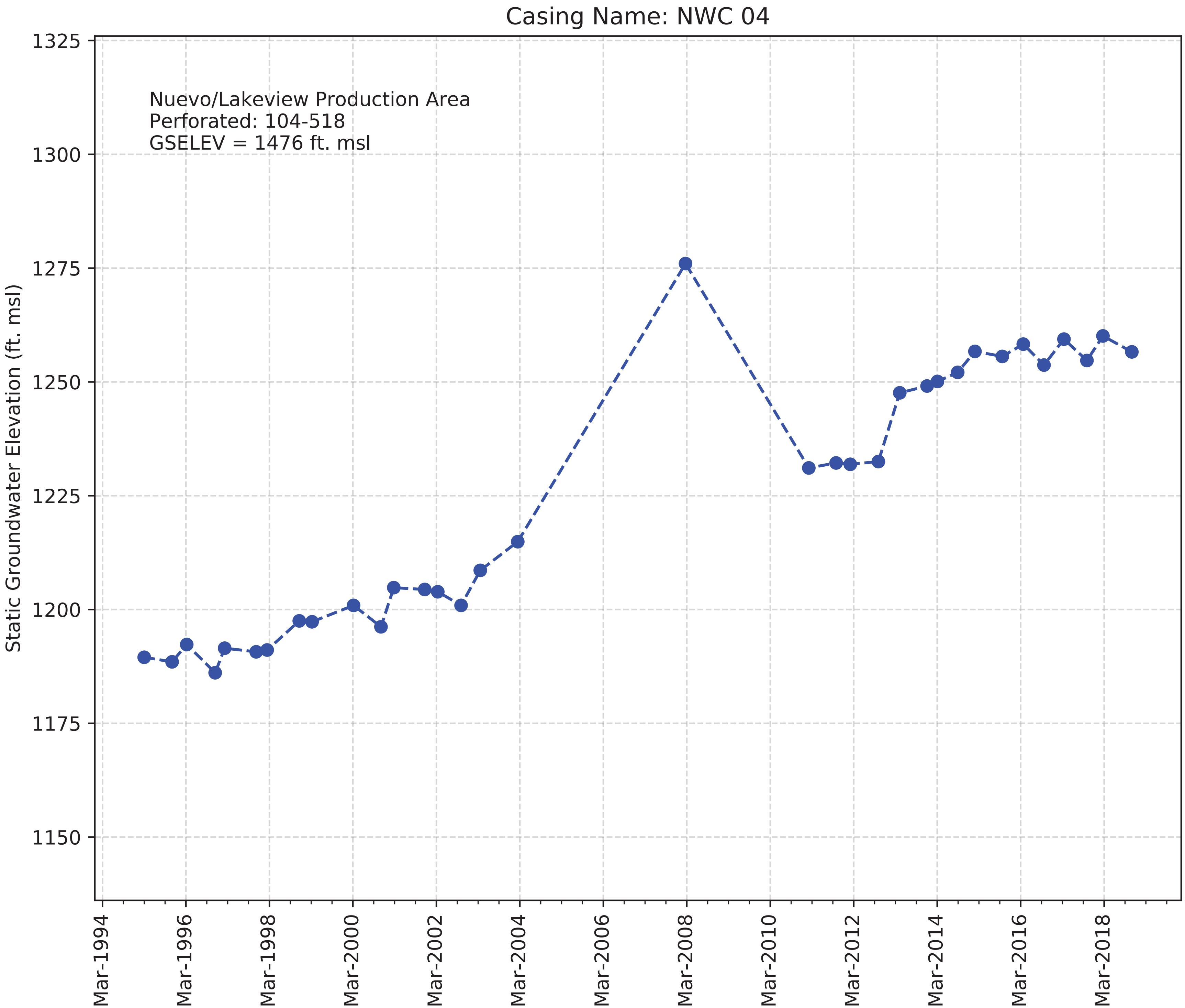

Casing Name: Offinga Dairy North
Nuevo/Lakeview Production Area
Perforated: 168-528
GSELEV = 1436 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
Jul-1966
Jul-1968
Jul-1970
Jul-1972
Jul-1974
Jul-1976
Jul-1978
Jul-1980
Jul-1982
Jul-1984
Jul-1986
Jul-1988
Jul-1990
Jul-1992
Jul-1994
Jul-1996
Jul-1998
Jul-2000
Jul-2002
Jul-2004
Jul-2006
Jul-2008
Jul-2010
Jul-2012
Jul-2014
Jul-2016
Jul-2018

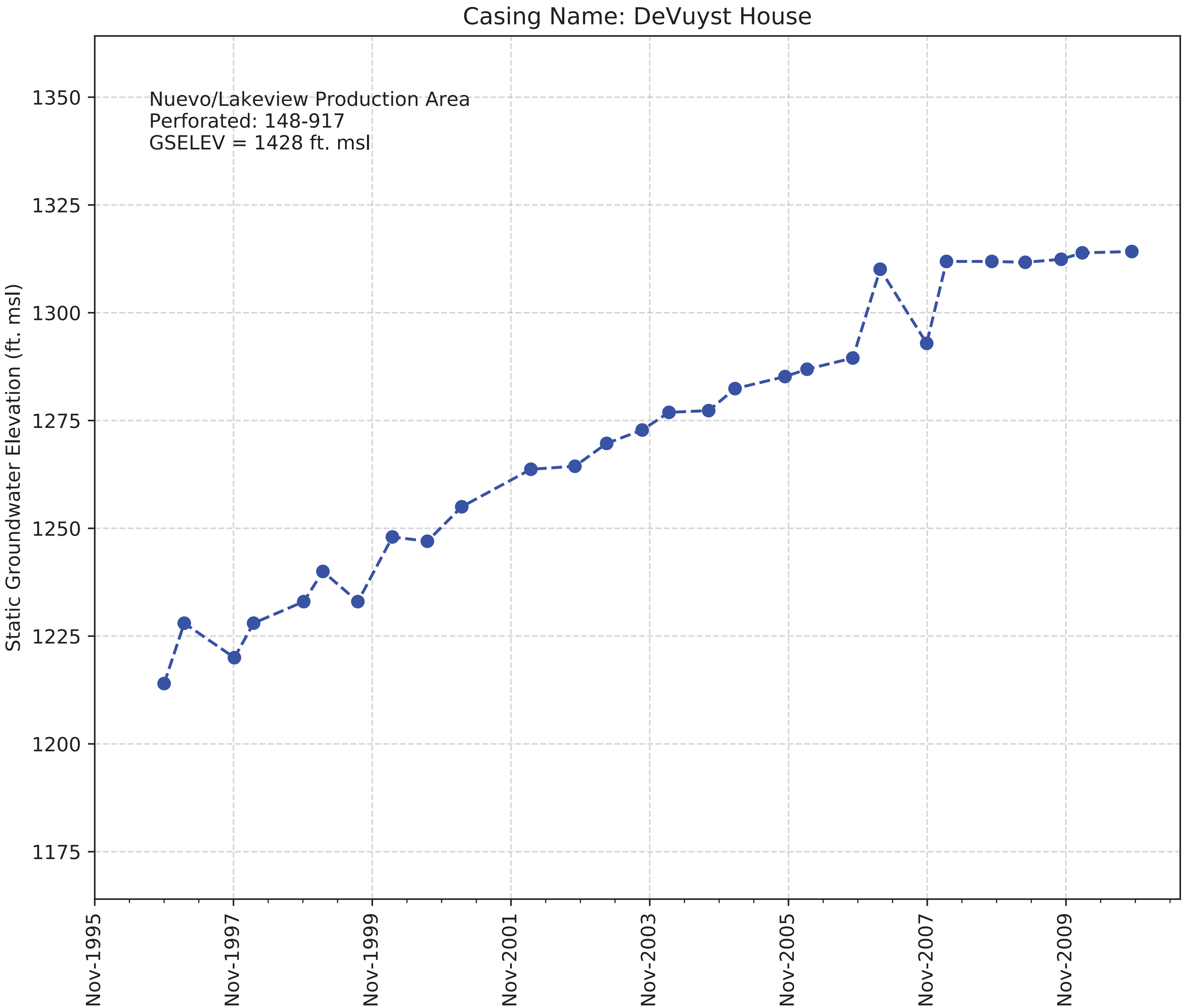

Casing Name: Bootsma, John
Nuevo/Lakeview Production Area
Perforated: 350-650
GSELEV = 1434 ft. msl
Static Groundwater Elevation (ft. msl)
1220
1200
1180
1160
1140
Oct-2002

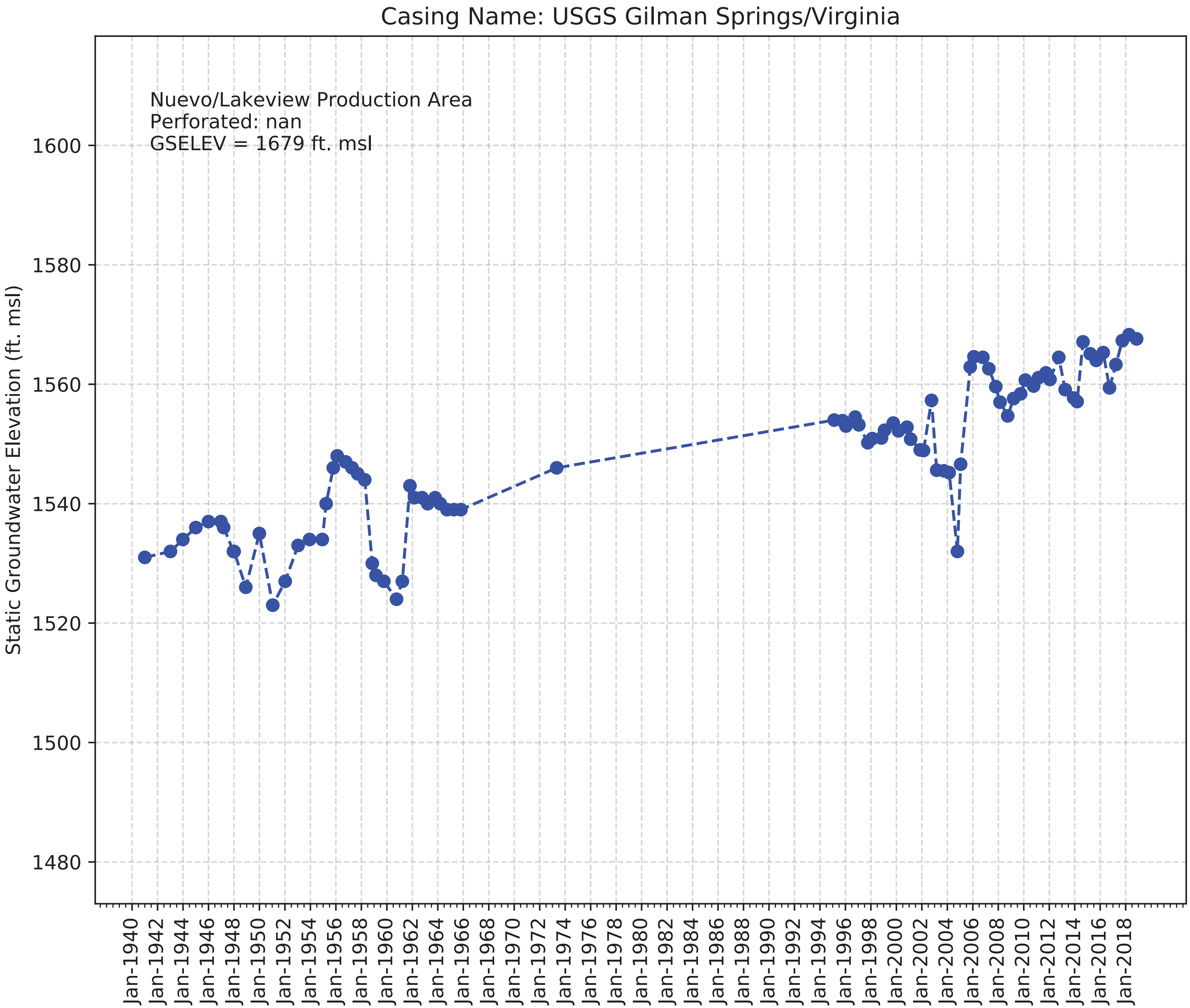

Casing Name: Offinga Dairy South
Nuevo/Lakeview Production Area
Perforated: 363-645
GSELEV = 1438 ft. msl
Static Groundwater Elevation (ft. msl)
1260
1240
1220
1200
1180
1160
1140
1120
Nov-1994
Nov-1996
Nov-1998
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008
Nov-2010
Nov-2012
Nov-2014

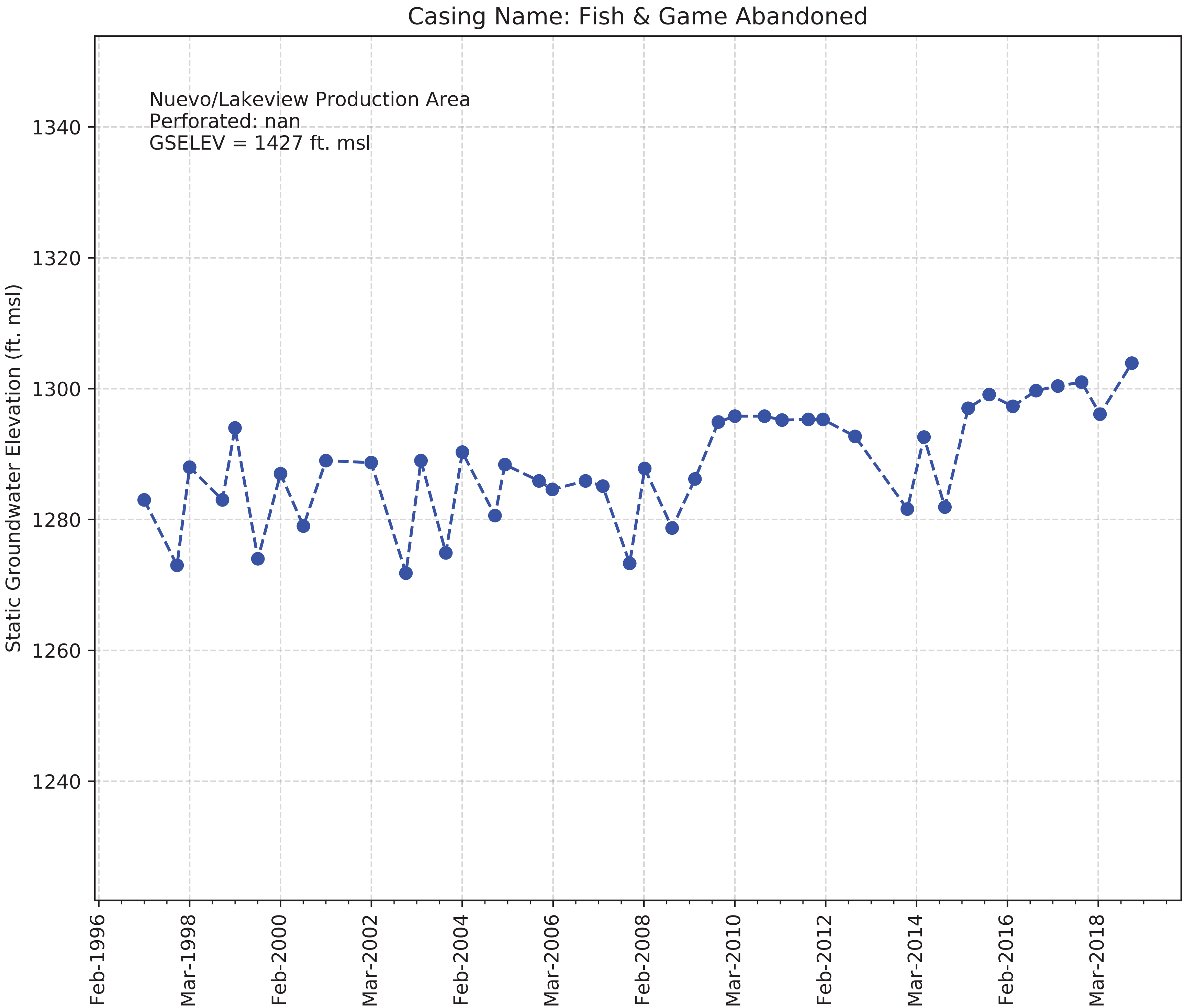

Casing Name: Motte East
Nuevo/Lakeview Production Area
Perforated: 300-643
GSELEV = 1440 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
1125
Jun-1966
Jun-1968
Jun-1970
Jun-1972
Jun-1974
Jun-1976
Jun-1978
Jun-1980
Jun-1982
Jun-1984
Jun-1986
Jun-1988
Jun-1990
Jun-1992
Jun-1994
Jun-1996
Jun-1998
Jun-2000
Jun-2002
Jun-2004
Jun-2006
Jun-2008
Jun-2010
Jun-2012
Jun-2014
Jun-2016
Jun-2018

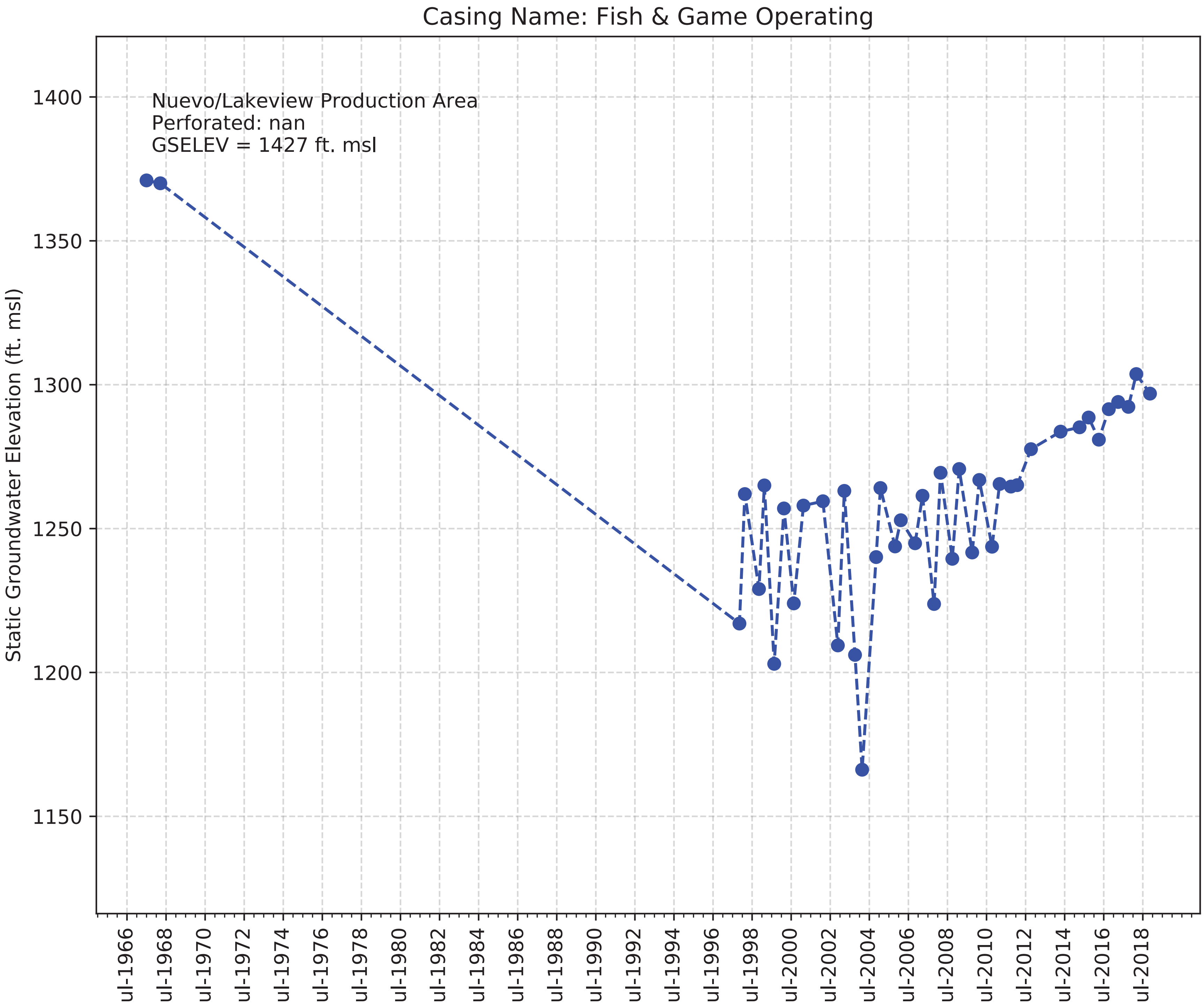

Casing Name: Motte West
Nuevo/Lakeview Production Area
Perforated: 113-473
GSELEV = 1439 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
1125
Mar-1966
Mar-1968
Mar-1970
Mar-1972
Mar-1974
Mar-1976
Mar-1978
Mar-1980
Mar-1982
Mar-1984
Mar-1986
Mar-1988
Mar-1990
Mar-1992
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018


Casing Name: NWC 04
Nuevo/Lakeview Production Area
Perforated: 104-518
GSELEV = 1476 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018


Casing Name: DeVuyst House
Nuevo/Lakeview Production Area
Perforated: 148-917
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1350
1325
1300
1275
1250
1225
1200
1175
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009


Casing Name: USGS Gilman Springs/Virginia
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1679 ft. msl
Static Groundwater Elevation (ft. msl)
1600
1580
1560
1540
1520
1500
1480
Jan-1940
Jan-1942
Jan-1944
Jan-1946
Jan-1948
Jan-1950
Jan-1952
Jan-1954
Jan-1956
Jan-1958
Jan-1960
Jan-1962
Jan-1964
Jan-1966
Jan-1968
Jan-1970
Jan-1972
Jan-1974
Jan-1976
Jan-1978
Jan-1980
Jan-1982
Jan-1984
Jan-1986
Jan-1988
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018


Casing Name: Fish & Game Abandoned
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1427 ft. msl
Static Groundwater Elevation (ft. msl)
1340
1320
1300
1280
1260
1240
Feb-1996
Mar-1998
Feb-2000
Mar-2002
Feb-2004
Mar-2006
Feb-2008
Mar-2010
Feb-2012
Mar-2014
Feb-2016
Mar-2018


Casing Name: Fish & Game Operating
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1427 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1350
1300
1250
1200
1150
Jul-1966
Jul-1968
Jul-1970
Jul-1972
Jul-1974
Jul-1976
Jul-1978
Jul-1980
Jul-1982
Jul-1984
Jul-1986
Jul-1988
Jul-1990
Jul-1992
Jul-1994
Jul-1996
Jul-1998
Jul-2000
Jul-2002
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Jul-2006
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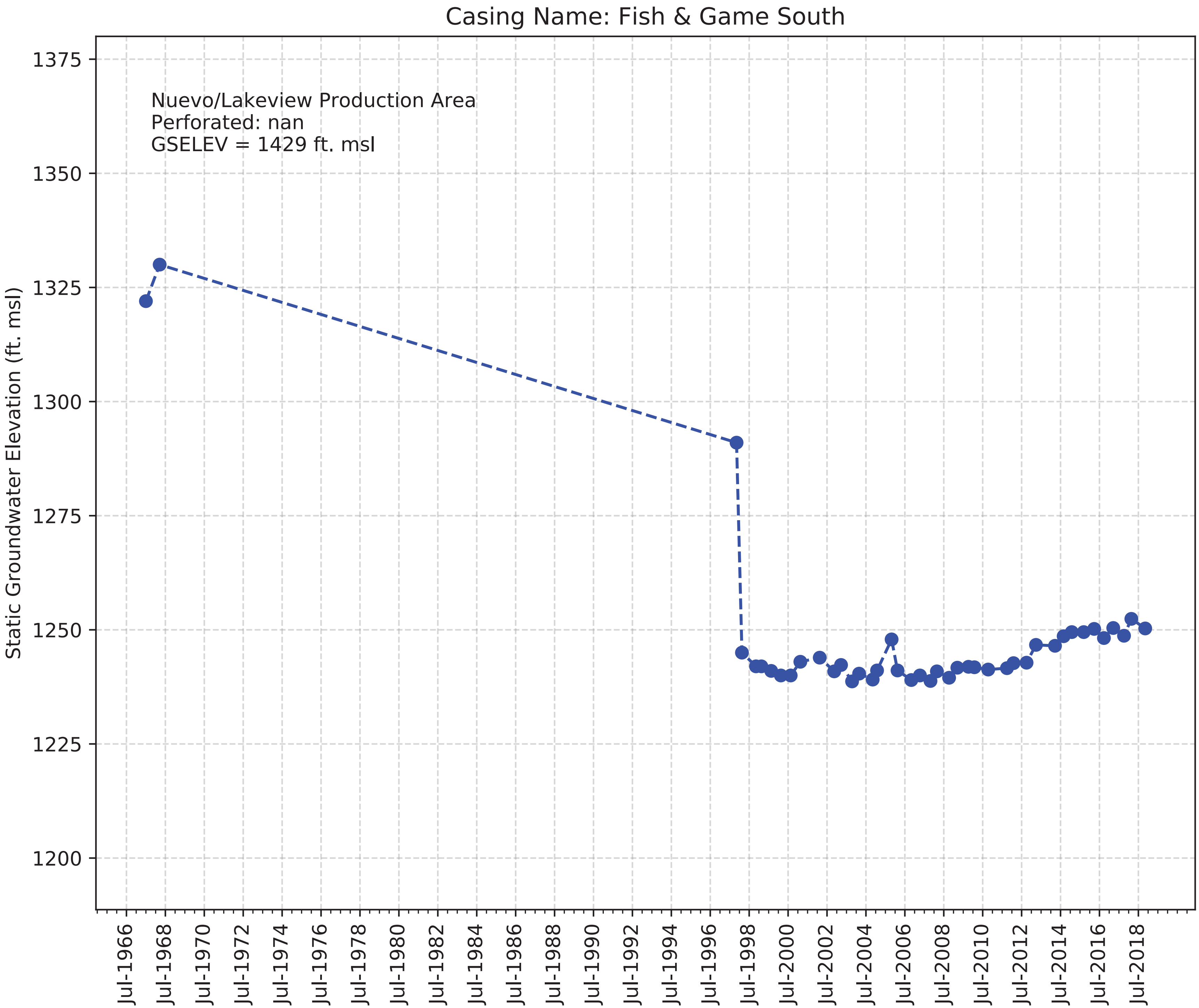
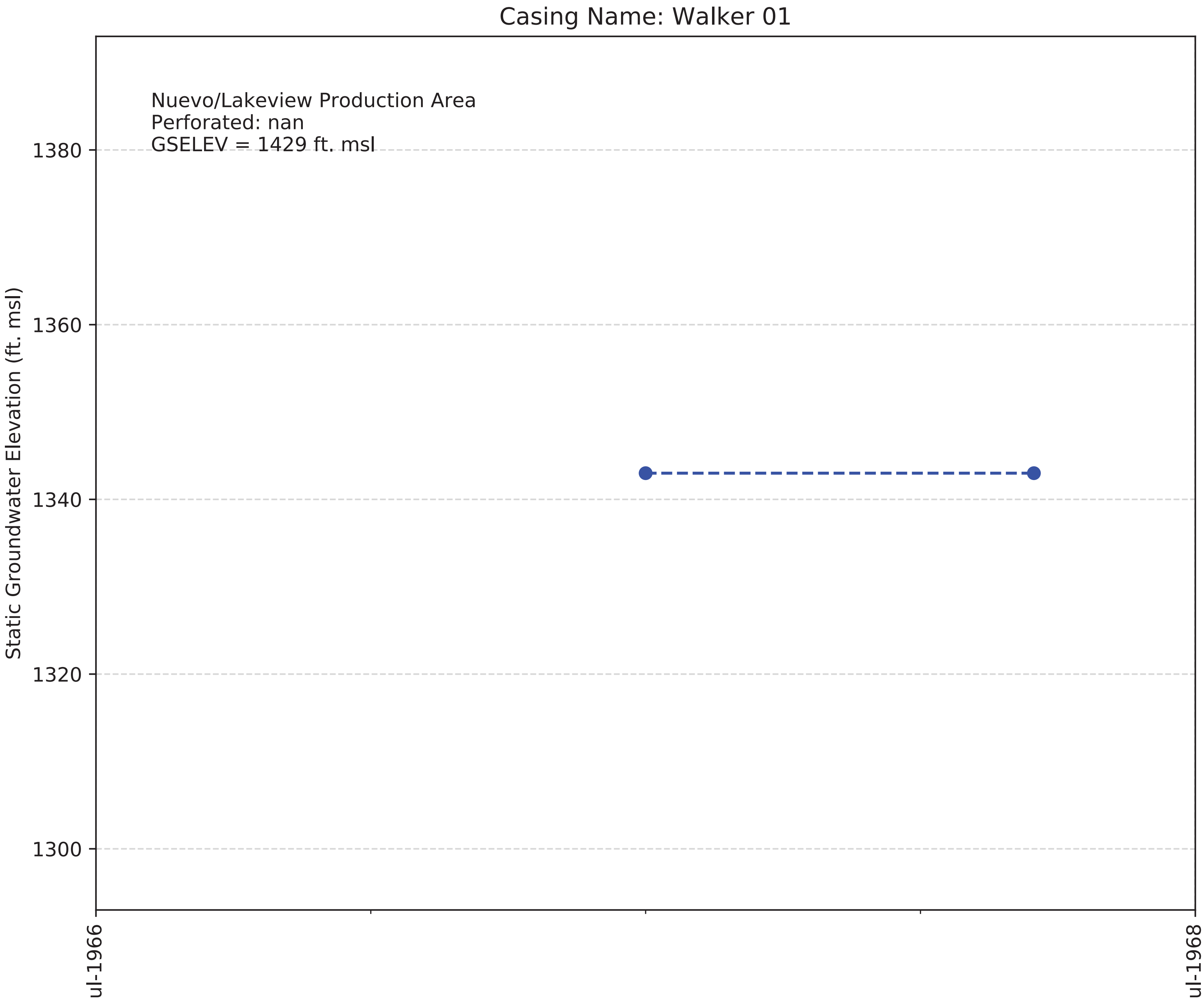
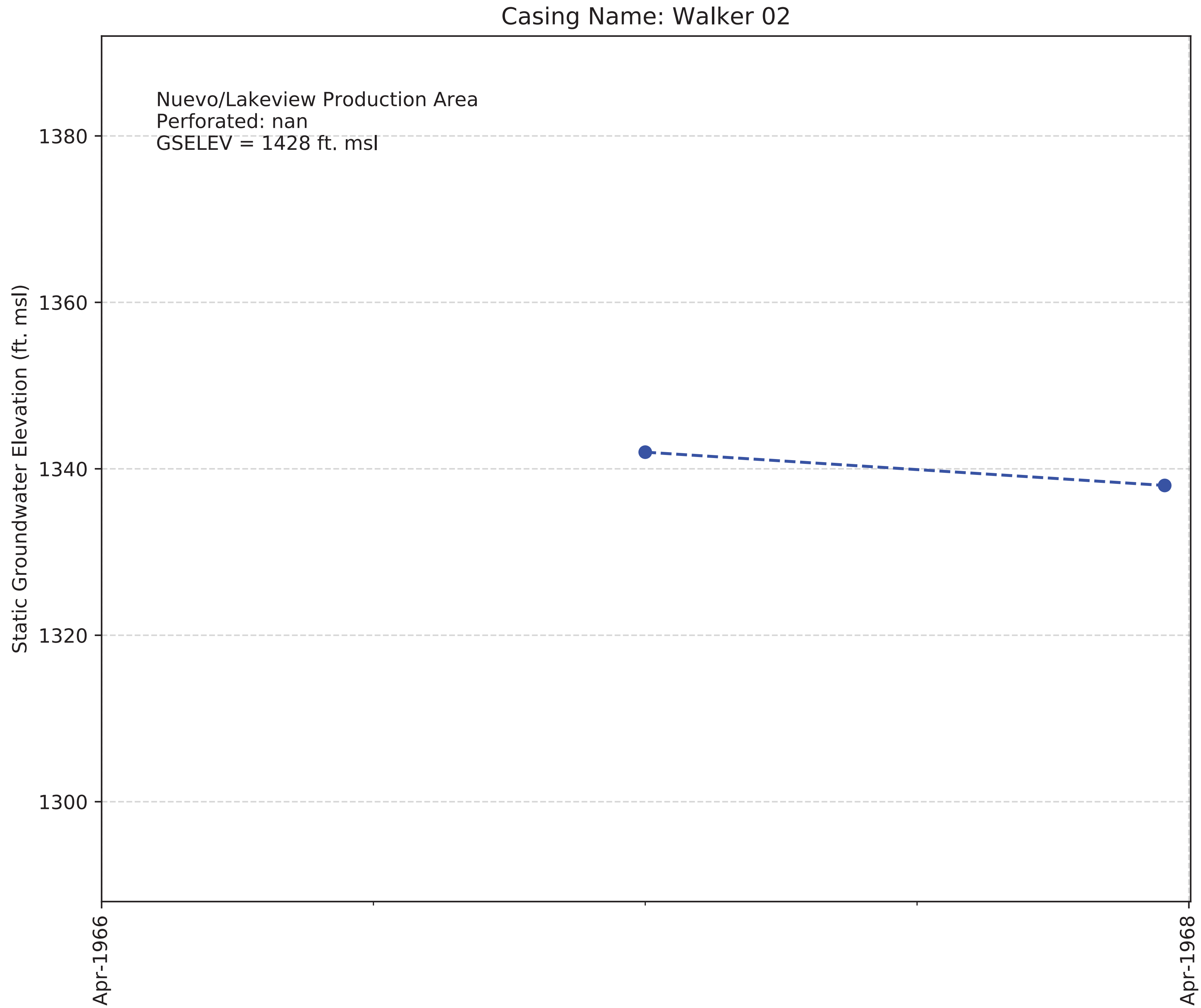
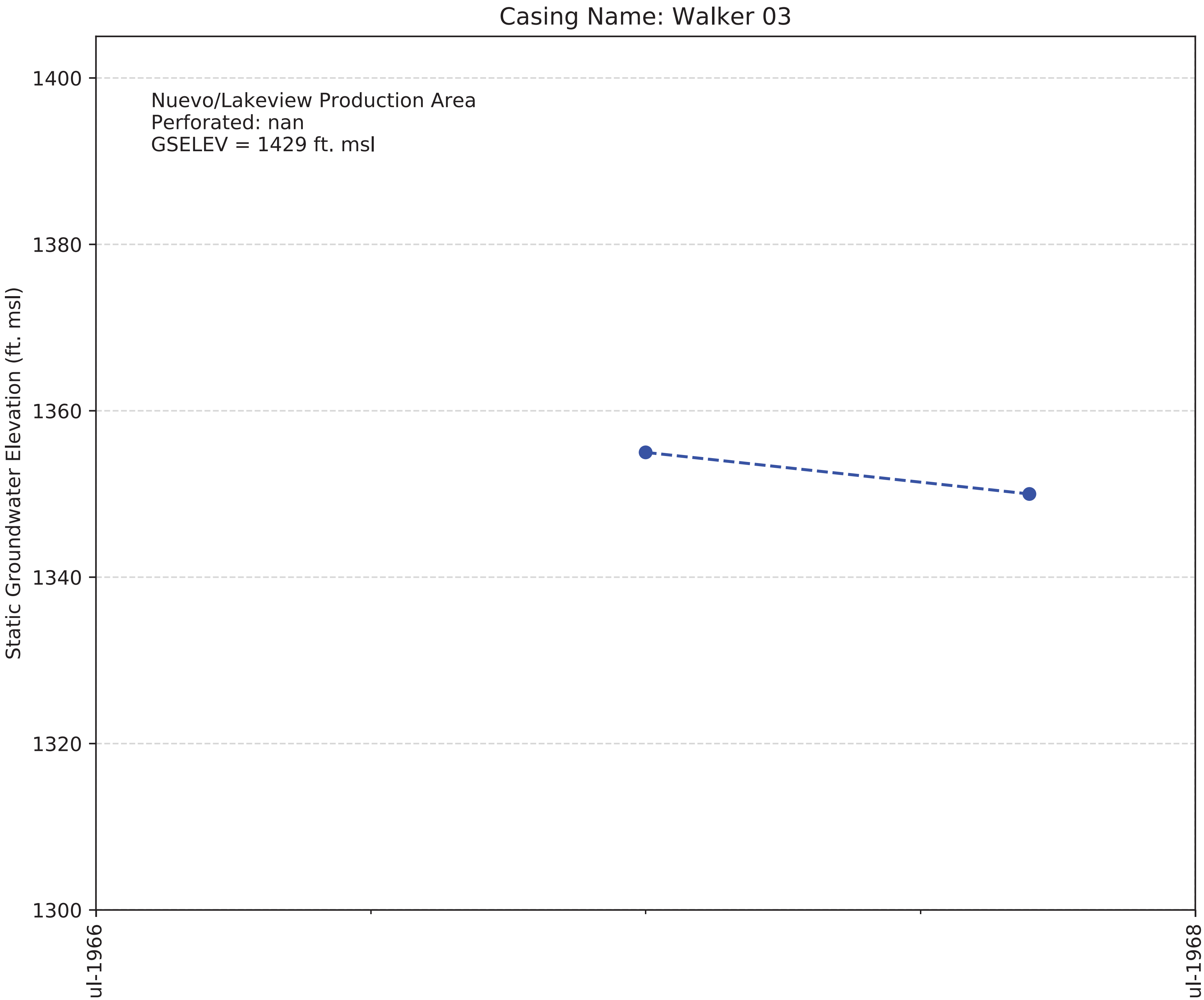
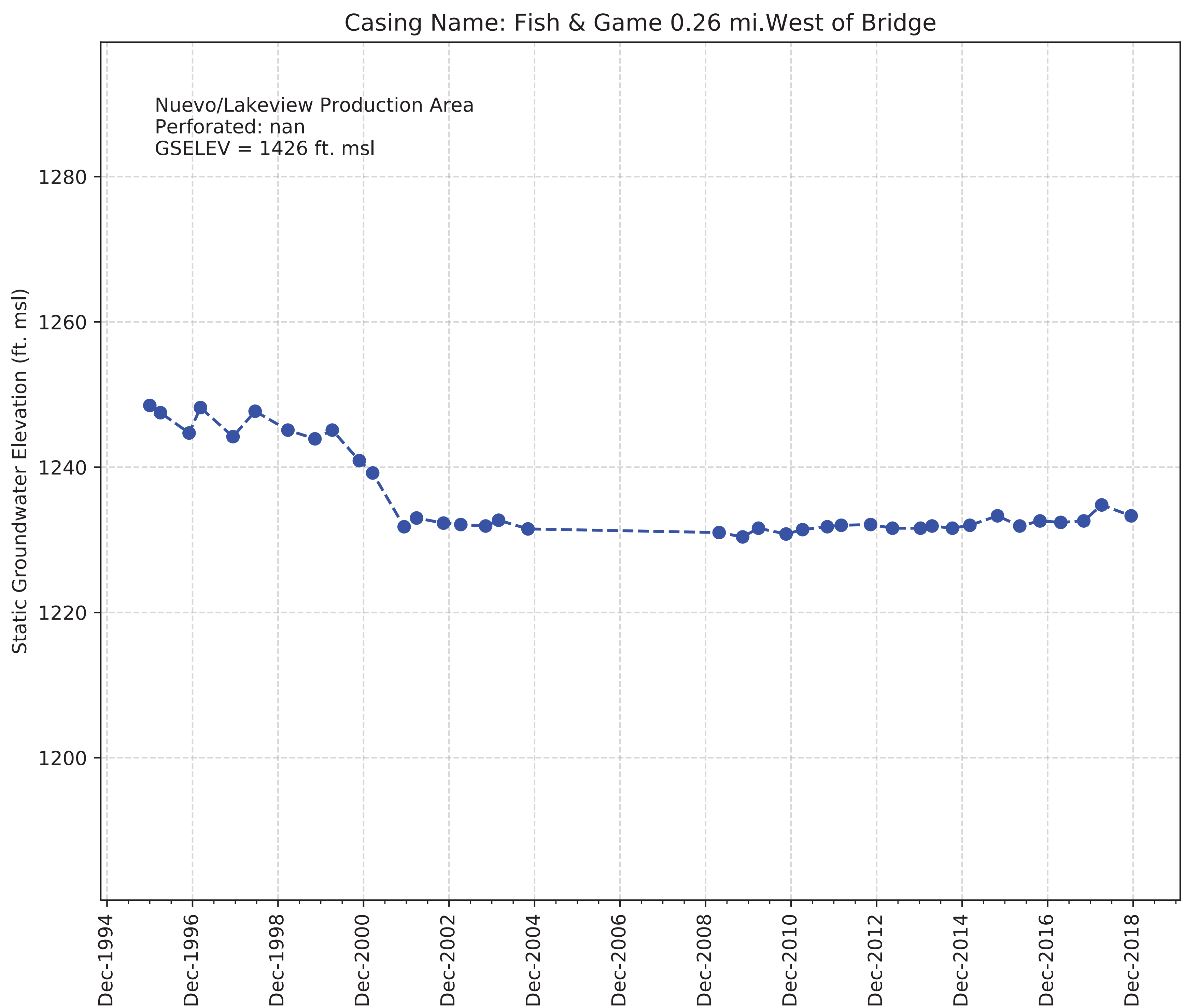
Jul-2014
Jul-2016
Jul-2018

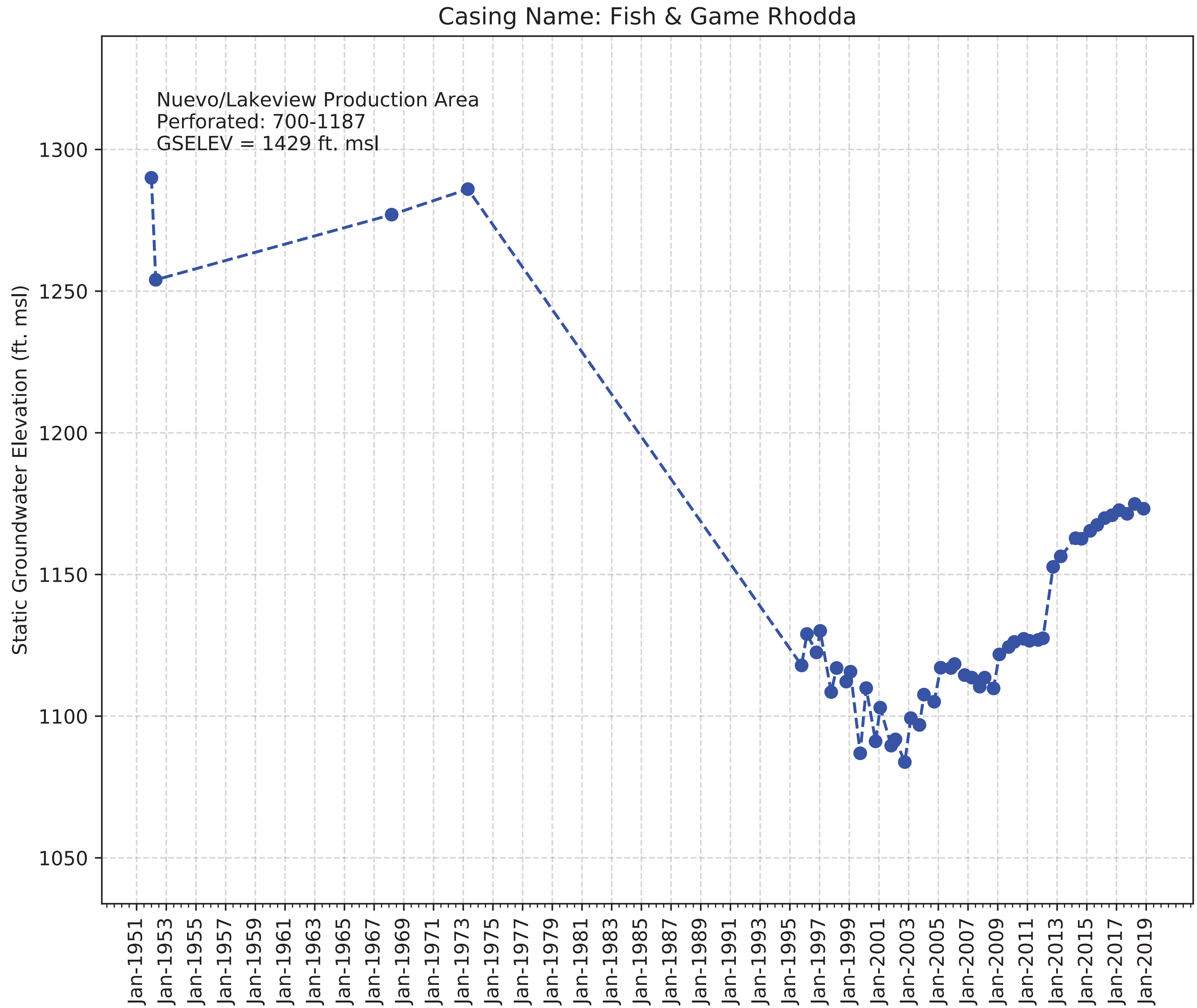

Casing Name: Fish & Game South
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1375
1350
1325
1300
1275
1250
1225
1200
Jul-1966
Jul-1968
Jul-1970
Jul-1972
Jul-1974
Jul-1976
Jul-1978
Jul-1980
Jul-1982
Jul-1984
Jul-1986
Jul-1988
Jul-1990
Jul-1992
Jul-1994
Jul-1996
Jul-1998
Jul-2000
Jul-2002
Jul-2004
Jul-2006
Jul-2008
Jul-2010
Jul-2012
Jul-2014
Jul-2016
Jul-2018

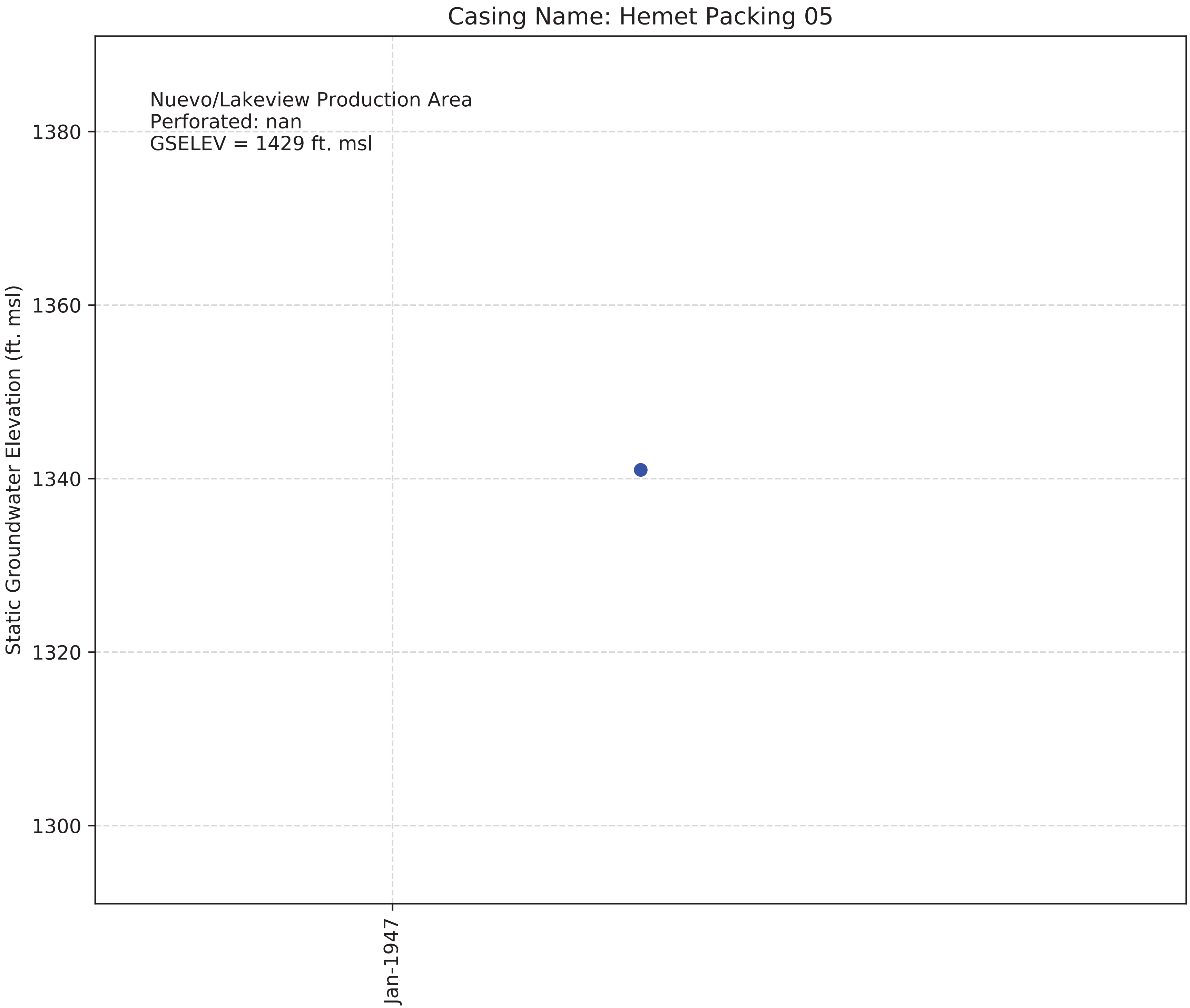

Casing Name: Walker 01
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
Jul-1966
Jul-1968

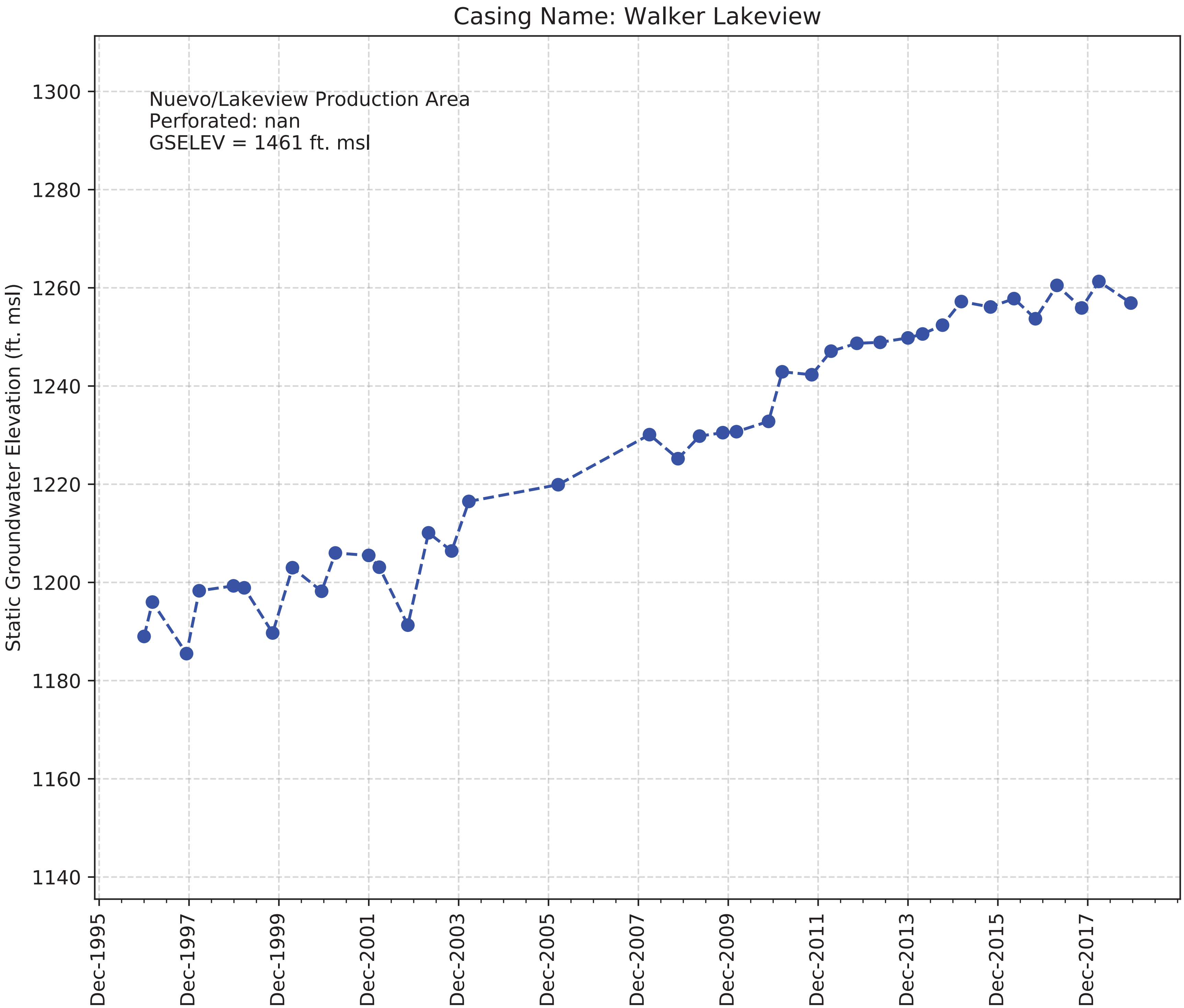

Casing Name: Walker 02
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
Apr-1966
Apr-1968

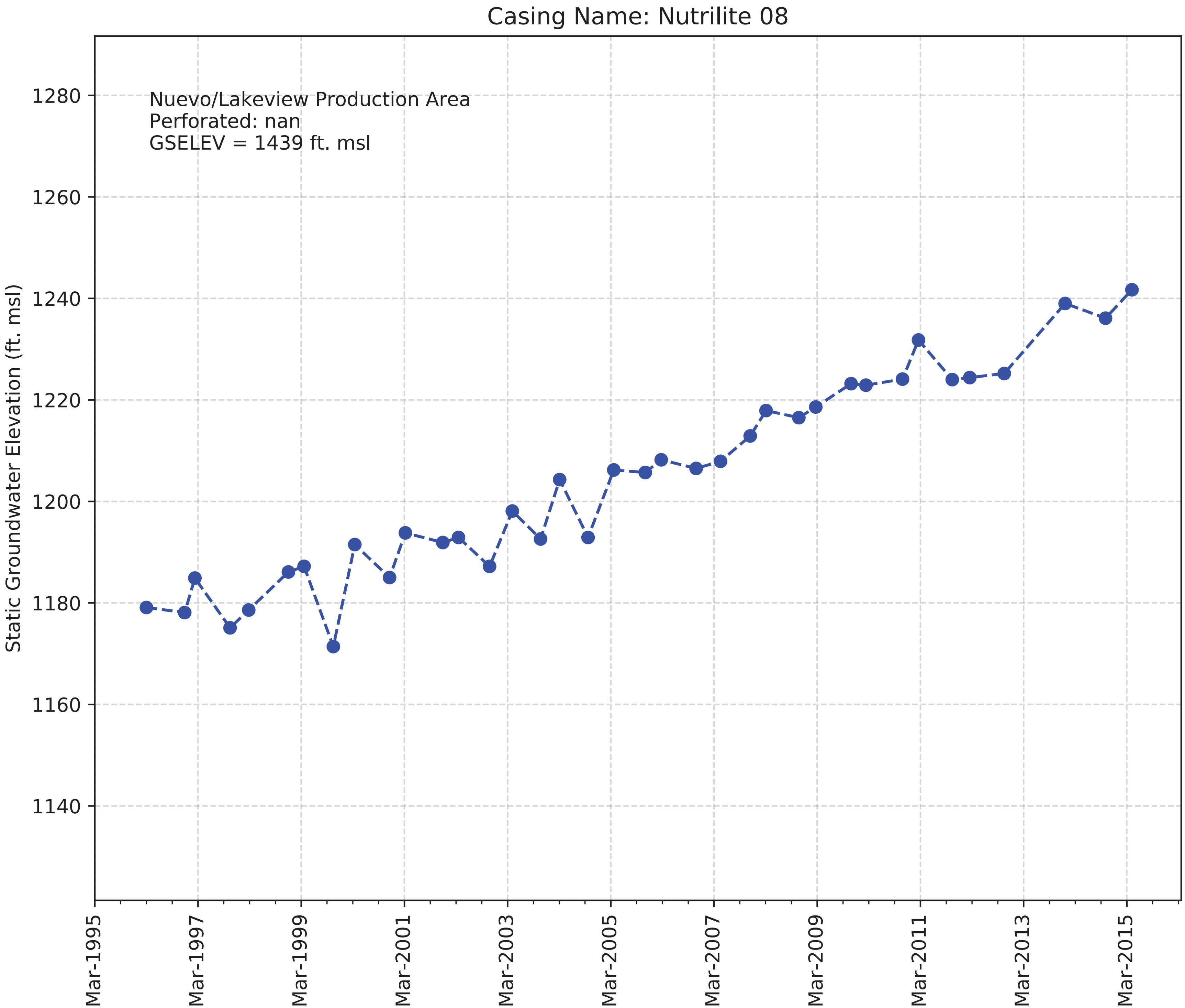

Casing Name: Walker 03
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
Jul-1966
Jul-1968

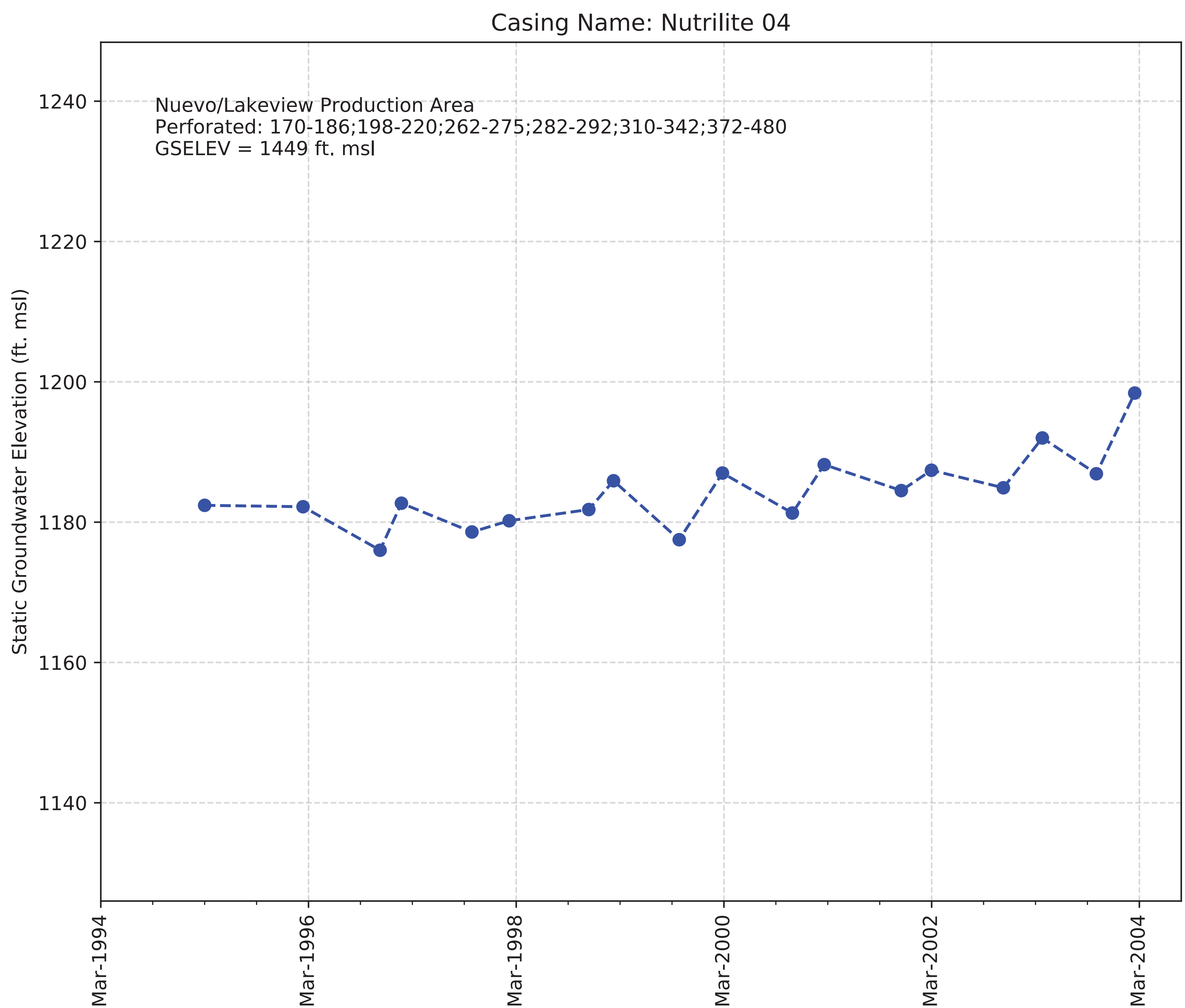

Casing Name: Fish & Game 0.26 mi.West of Bridge
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1426 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
Dec-1994
Dec-1996
Dec-1998
Dec-2000
Dec-2002
Dec-2004
Dec-2006
Dec-2008
Dec-2010
Dec-2012
Dec-2014
Dec-2016
Dec-2018

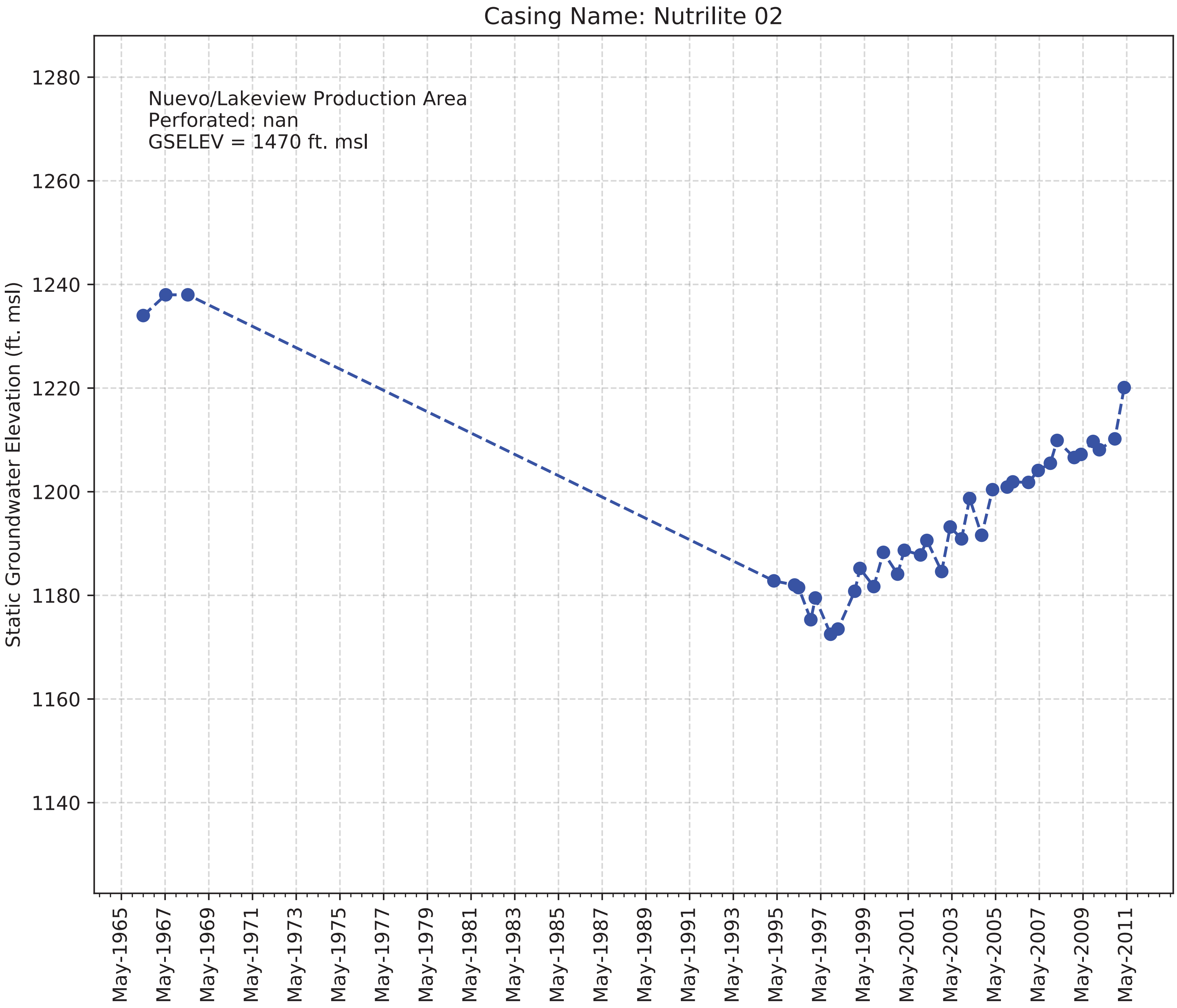

Casing Name: Fish & Game Rhodda
Nuevo/Lakeview Production Area
Perforated: 700-1187
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1250
1200
1150
1100
1050
Jan-1951
Jan-1953
Jan-1955
Jan-1957
Jan-1959
Jan-1961
Jan-1963
Jan-1965
Jan-1967
Jan-1969
Jan-1971
Jan-1973
Jan-1975
Jan-1977
Jan-1979
Jan-1981
Jan-1983
Jan-1985
Jan-1987
Jan-1989
Jan-1991
Jan-1993
Jan-1995
Jan-1997
Jan-1999
Jan-2001
Jan-2003
Jan-2005
Jan-2007
Jan-2009
Jan-2011
Jan-2013
Jan-2015
Jan-2017
Jan-2019

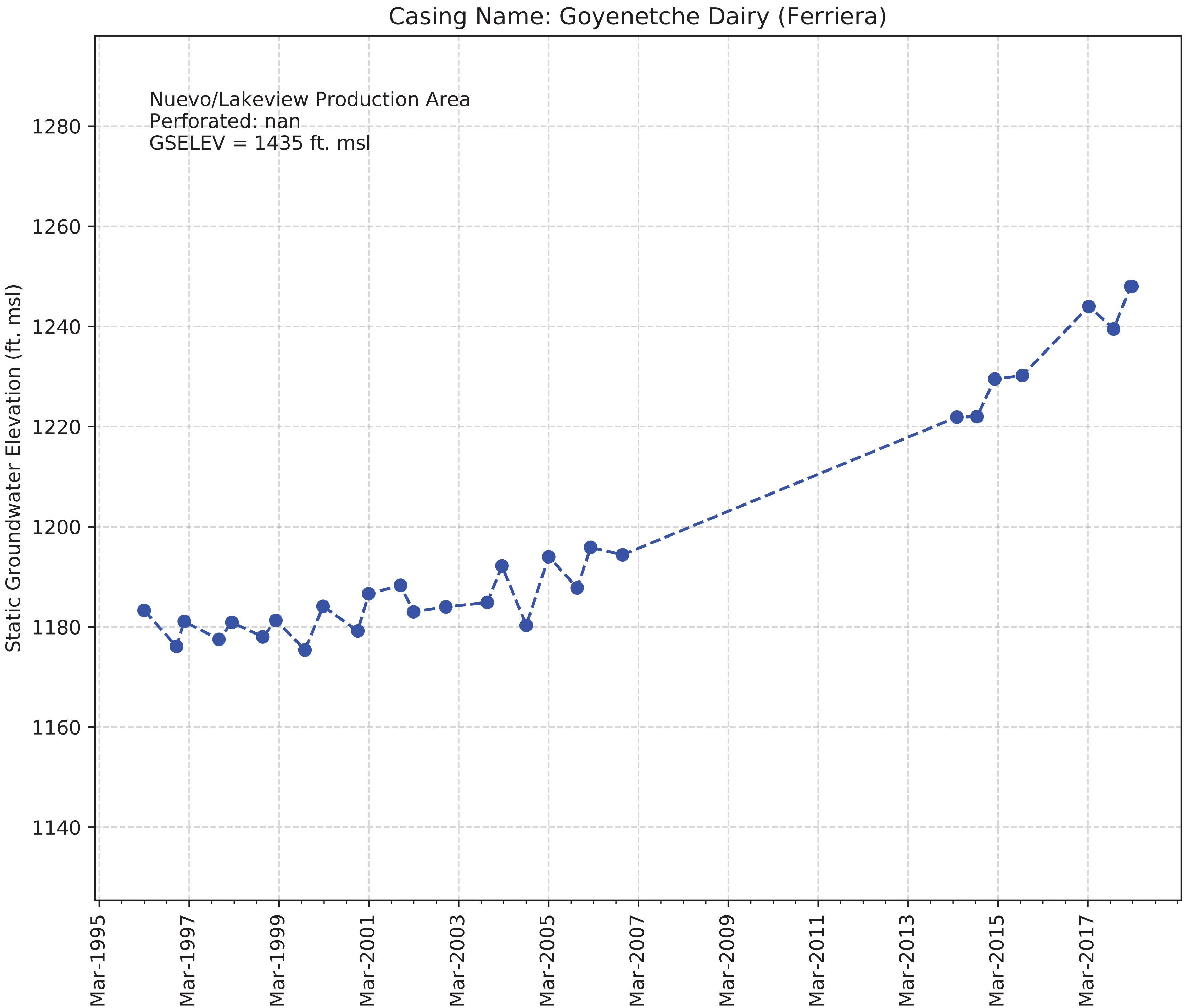

Casing Name: Hemet Packing 05
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
Jan-1947

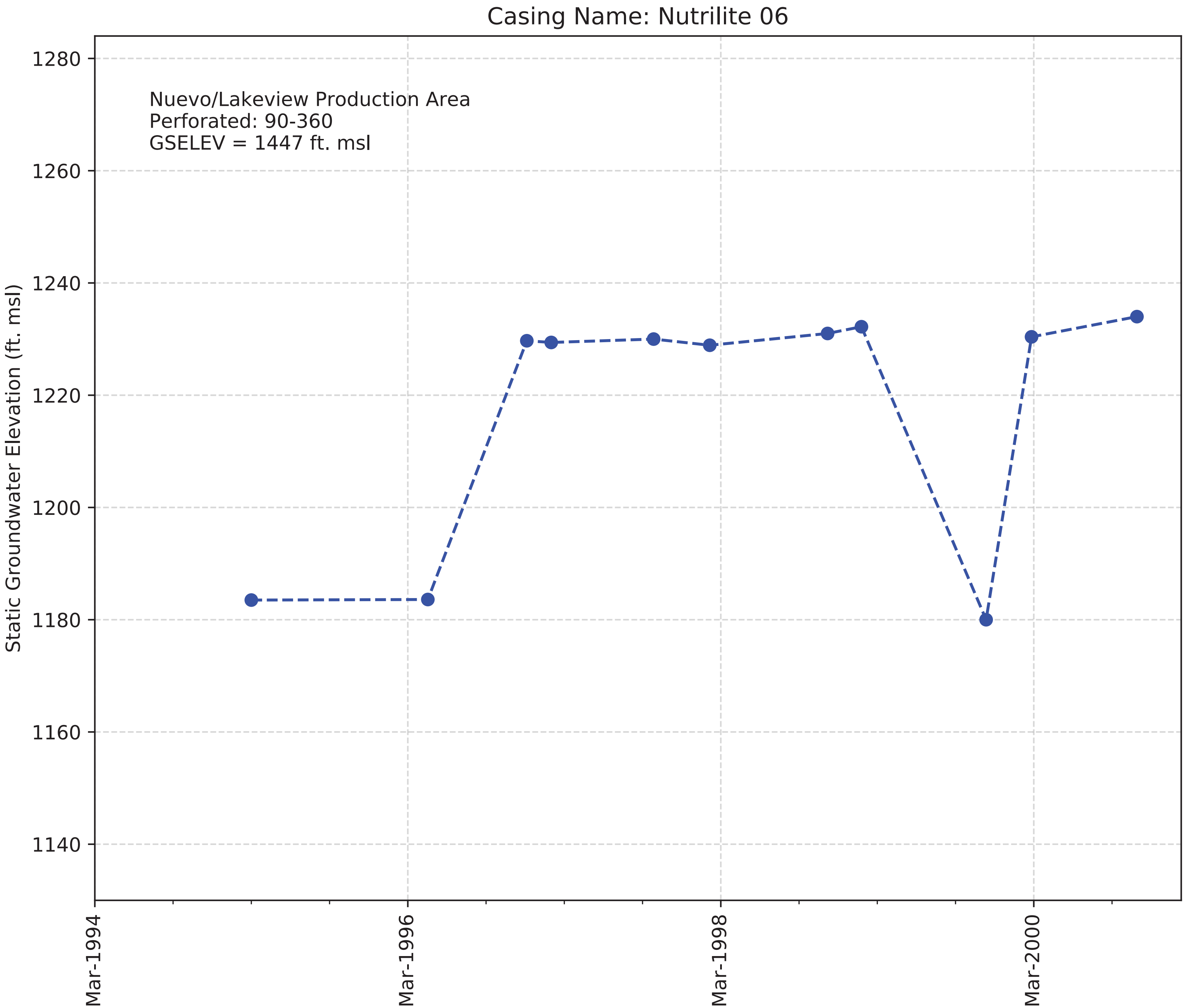

Casing Name: Walker Lakeview
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1461 ft. msl
Static Groundwater Elevation (ft. msl)
1140
1160
1180
1200
1220
1240
1260
1280
1300
Dec-1995
Dec-1997
Dec-1999
Dec-2001
Dec-2003
Dec-2005
Dec-2007
Dec-2009
Dec-2011
Dec-2013
Dec-2015
Dec-2017

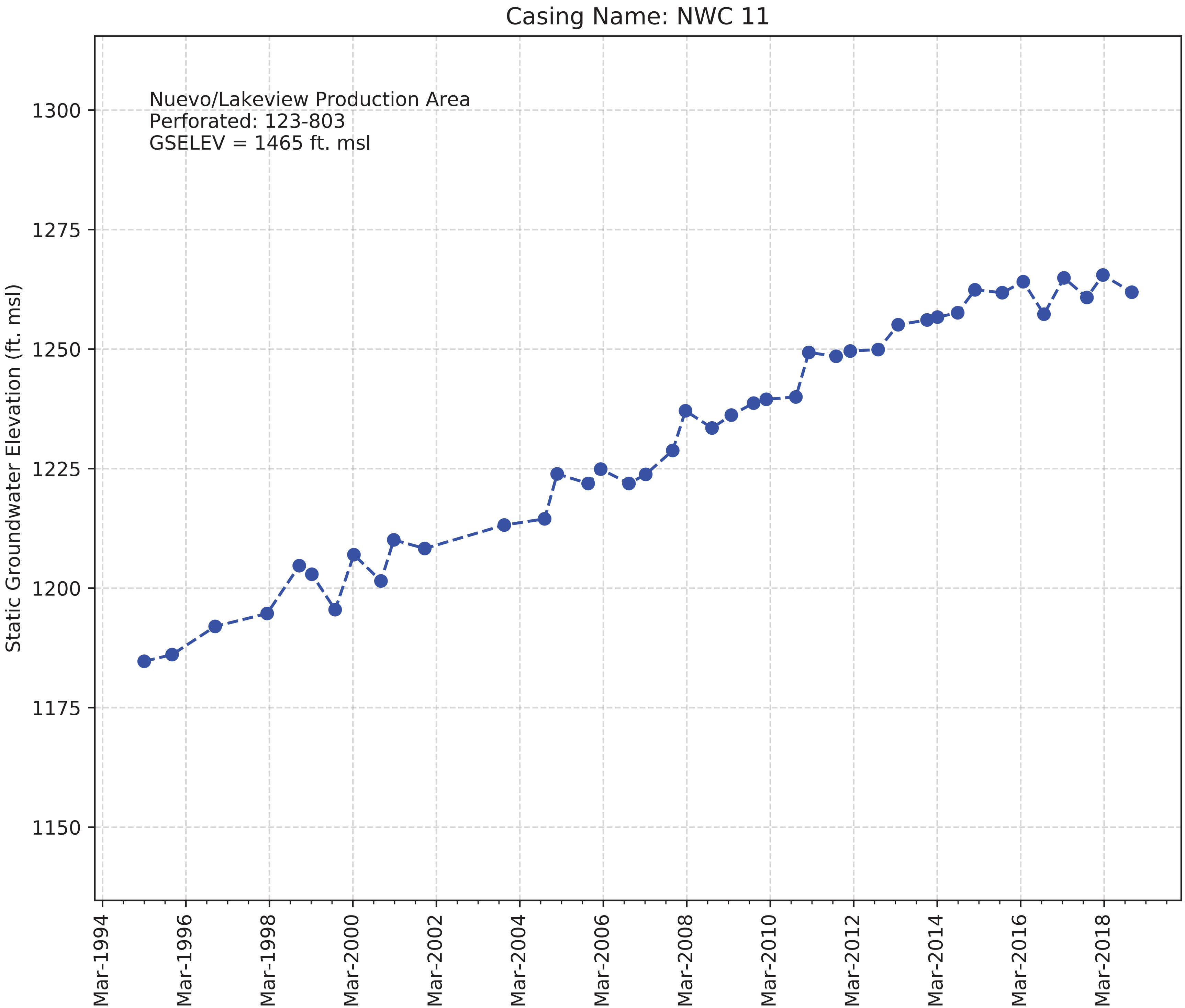

Casing Name: Nutrilite 08
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1439 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
1180
1160
1140
Mar-1995
Mar-1997
Mar-1999
Mar-2001
Mar-2003
Mar-2005
Mar-2007
Mar-2009
Mar-2011
Mar-2013
Mar-2015

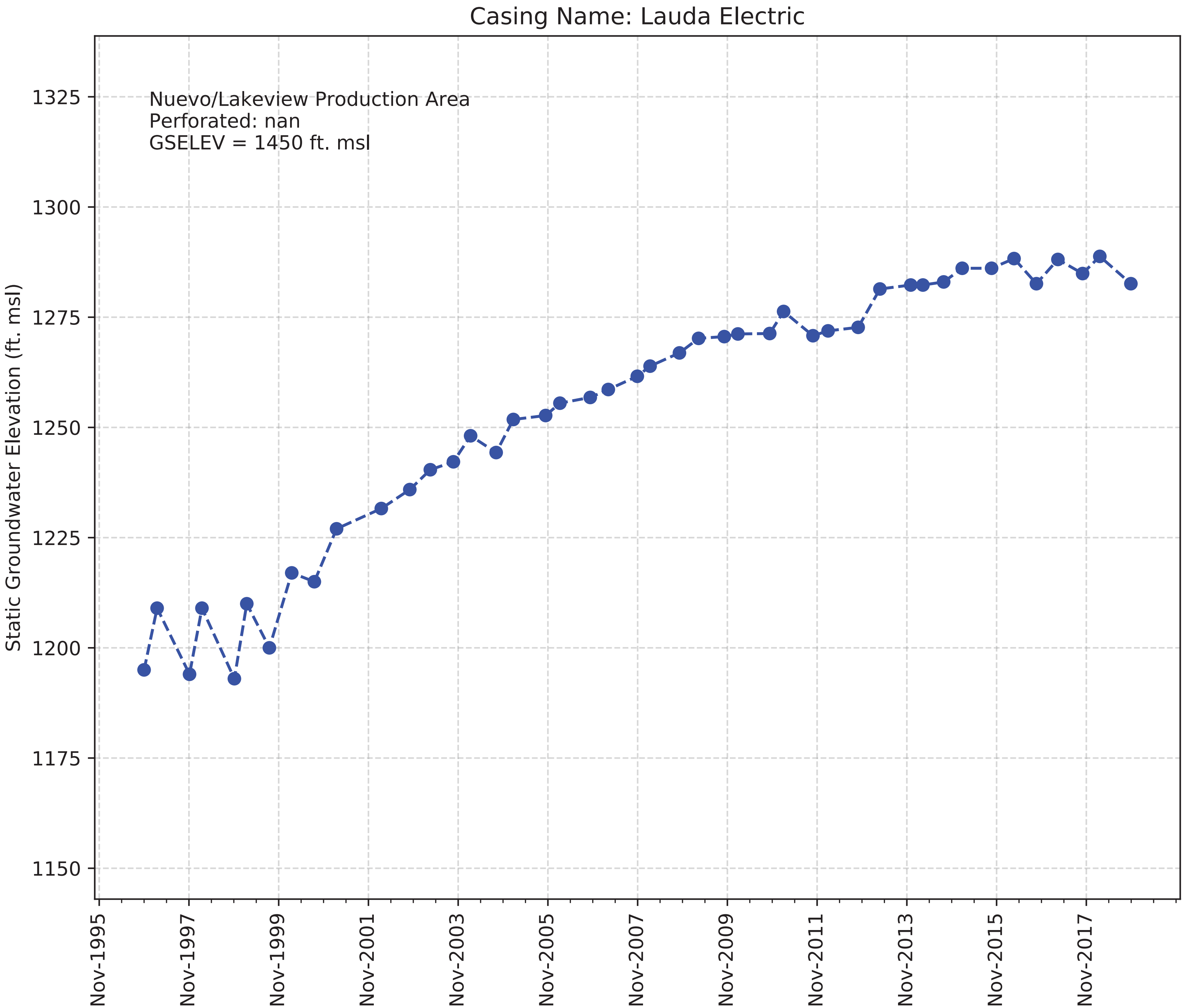

Casing Name: Nutrilite 04
Nuevo/Lakeview Production Area
Perforated: 170-186;198-220;262-275;282-292;310-342;372-480
GSELEV = 1449 ft. msl
Static Groundwater Elevation (ft. msl)
1240
1220
1200
1180
1160
1140
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004

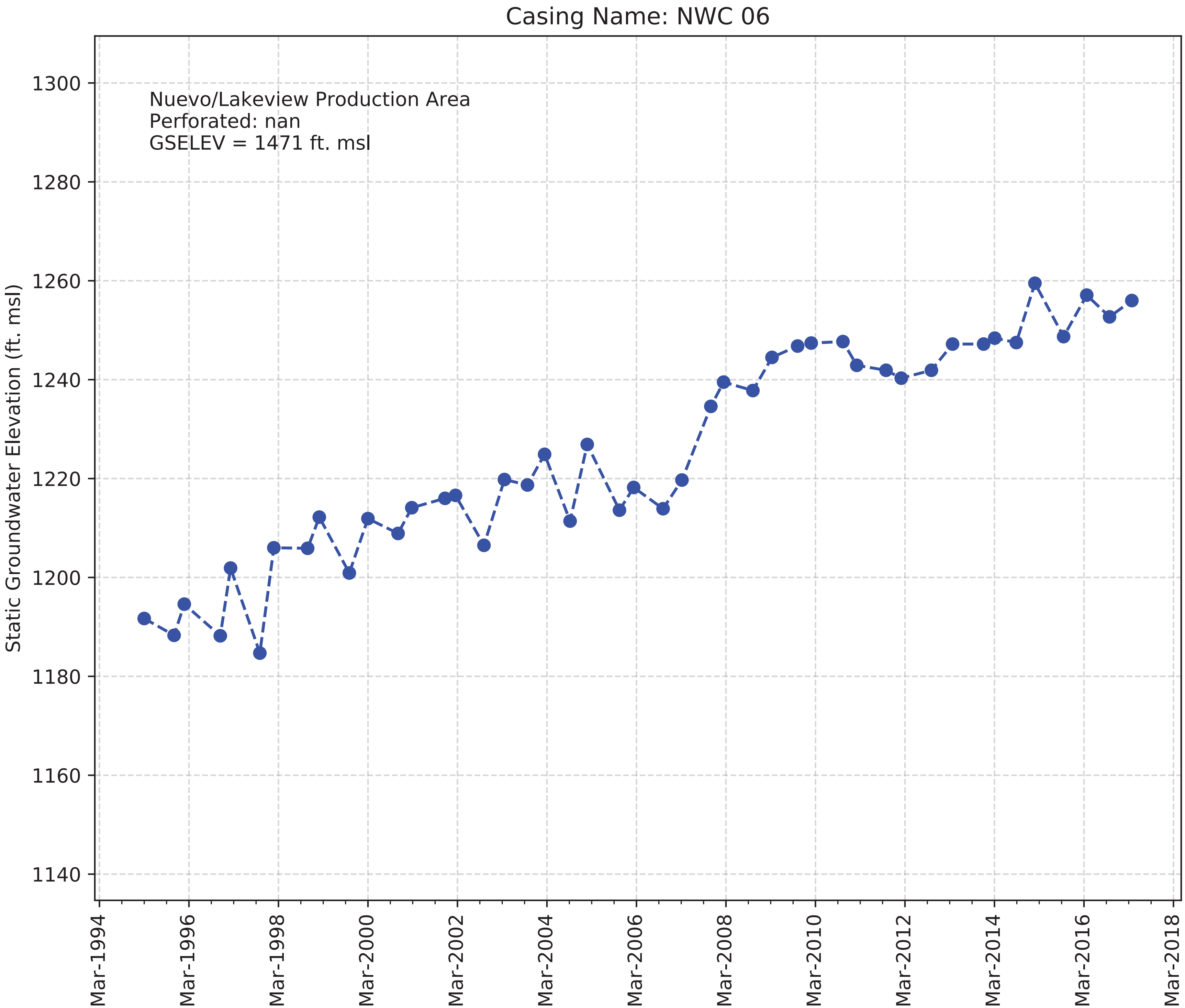

Casing Name: Nutrilite 02
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1470 ft. msl
Static Groundwater Elevation (ft. msl)
1140
1160
1180
1200
1220
1240
1260
1280
May-1965
May-1967
May-1969
May-1971
May-1973
May-1975
May-1977
May-1979
May-1981
May-1983
May-1985
May-1987
May-1989
May-1991
May-1993
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007
May-2009
May-2011

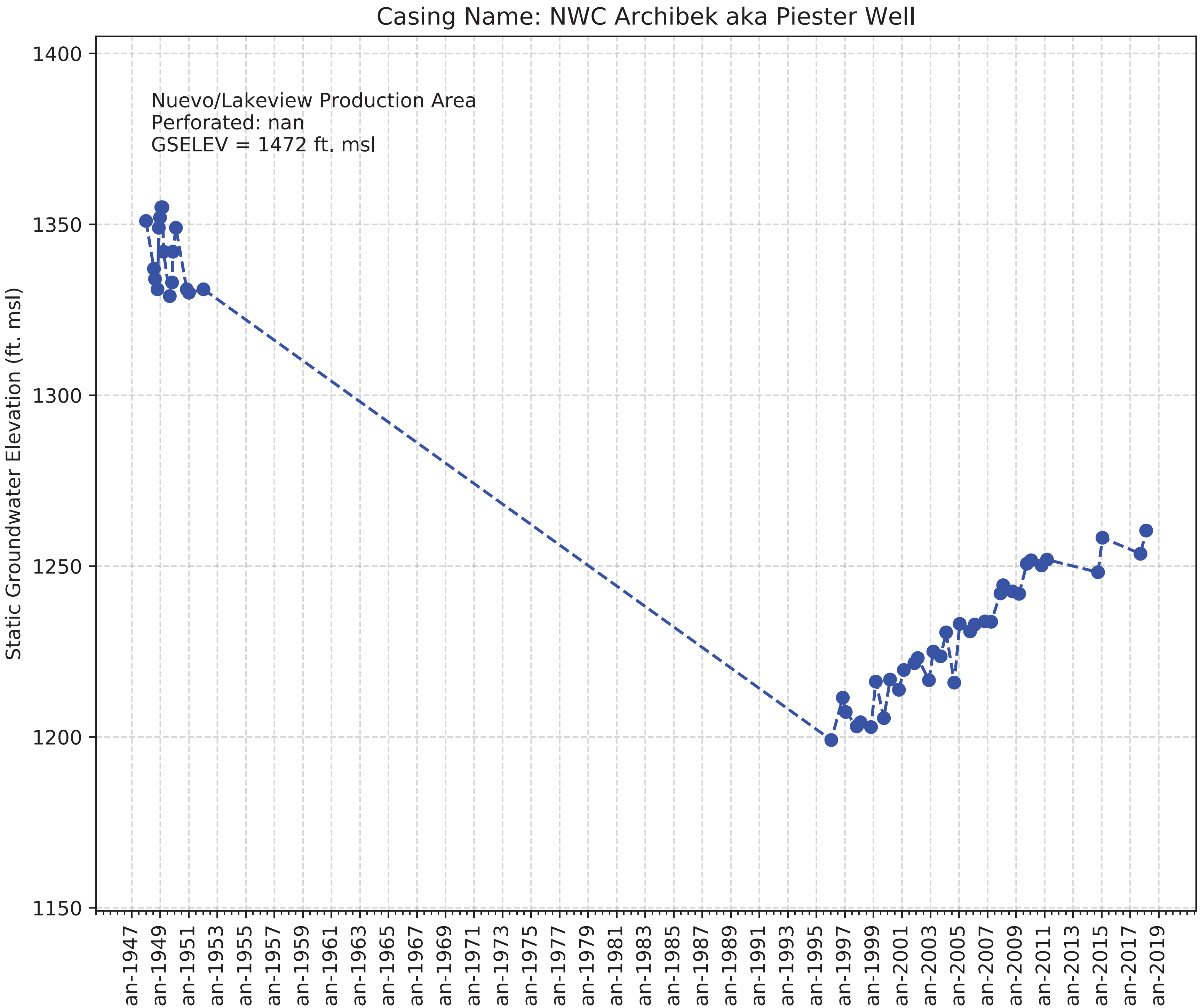

Casing Name: Goyenetche Dairy (Ferriera)
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1435 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
1180
1160
1140
Mar-1995
Mar-1997
Mar-1999
Mar-2001
Mar-2003
Mar-2005
Mar-2007
Mar-2009
Mar-2011
Mar-2013
Mar-2015
Mar-2017

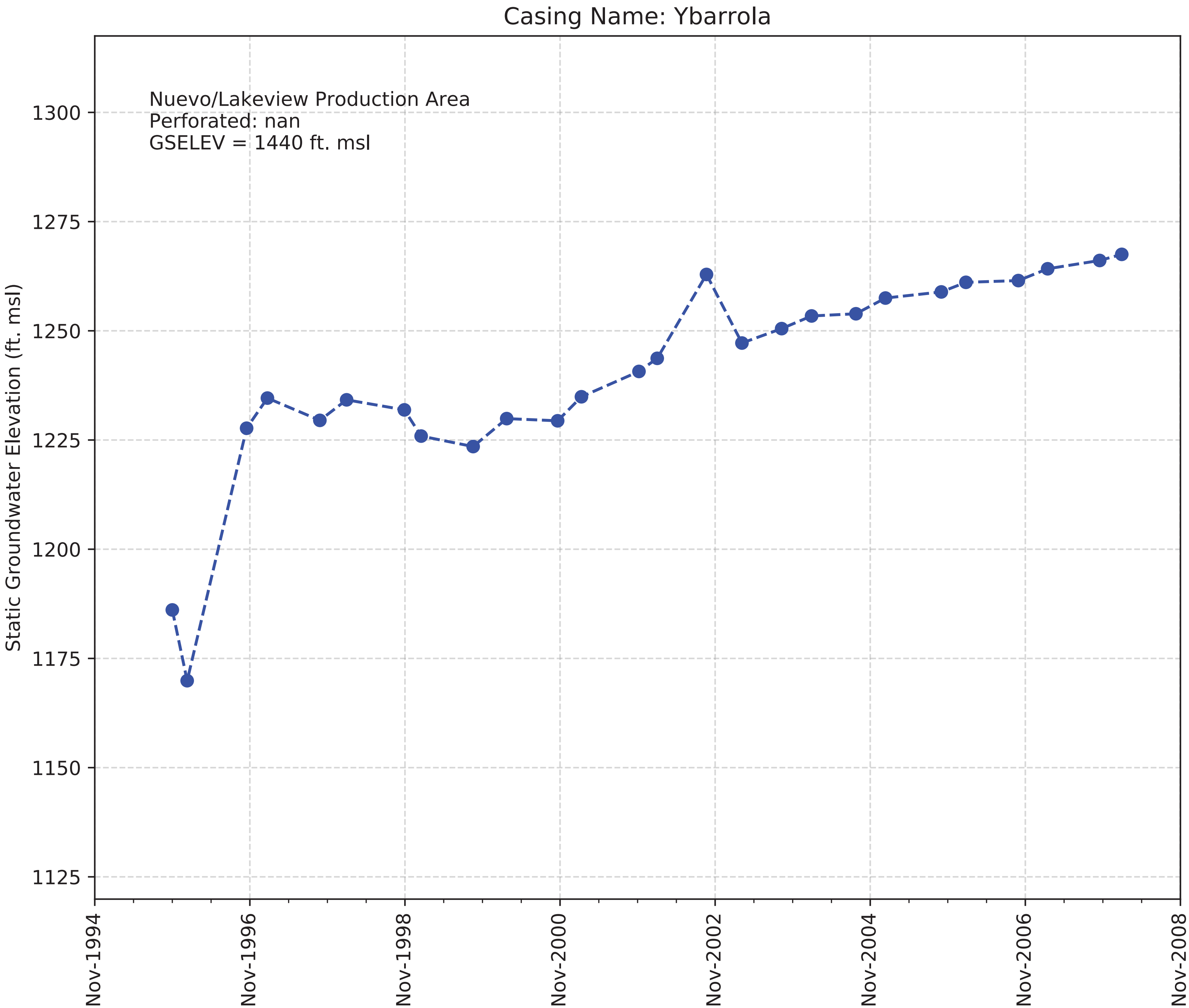

Casing Name: Nutrilite 06
Nuevo/Lakeview Production Area
Perforated: 90-360
GSELEV = 1447 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
1180
1160
1140
Mar-1994
Mar-1996
Mar-1998
Mar-2000

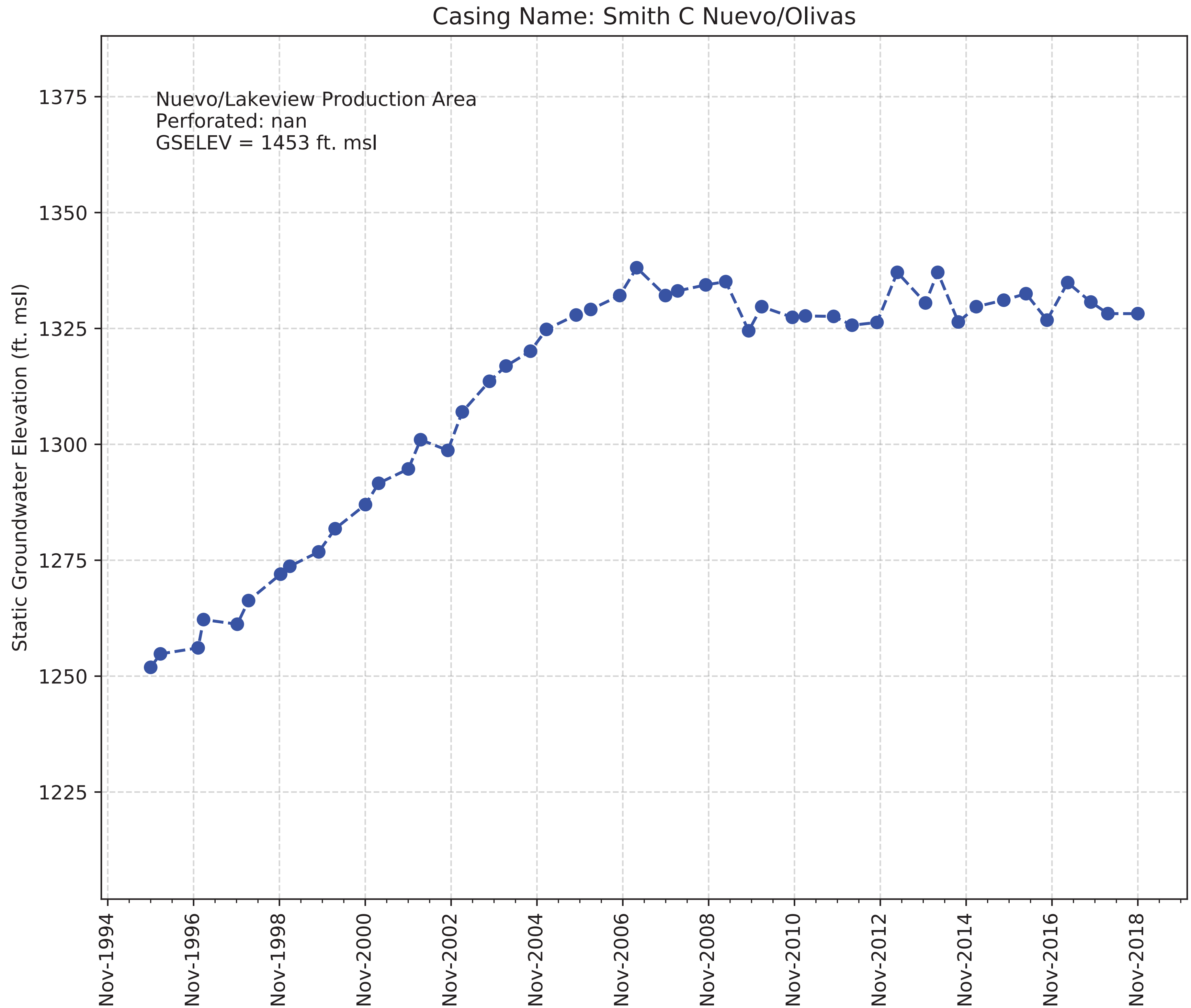

Casing Name: NWC 11
Nuevo/Lakeview Production Area
Perforated: 123-803
GSELEV = 1465 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1275
1250
1225
1200
1175
1150
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

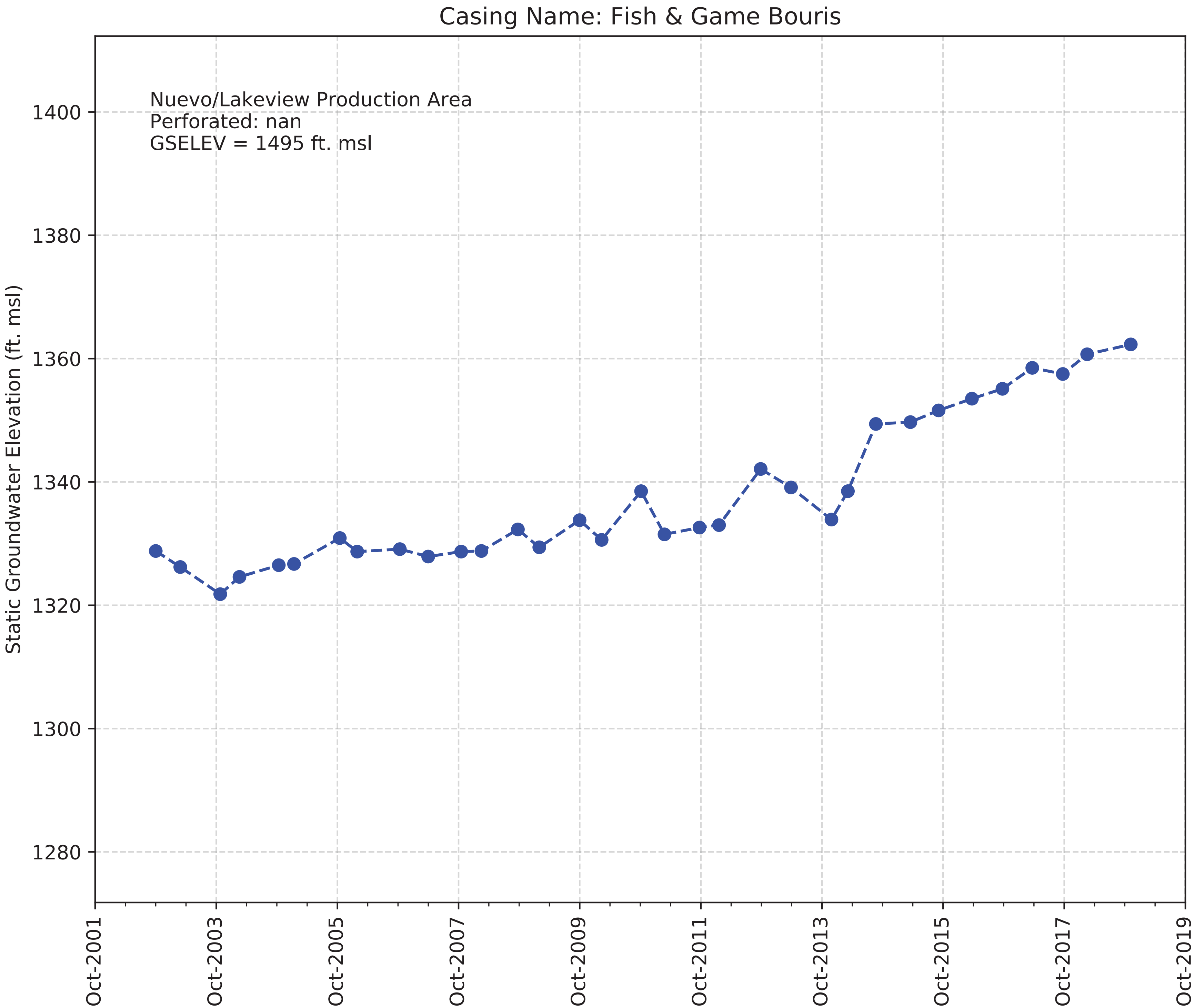

Casing Name: Lauda Electric
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1450 ft. msl
Static Groundwater Elevation (ft. msl)
1325
1300
1275
1250
1225
1200
1175
1150
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017

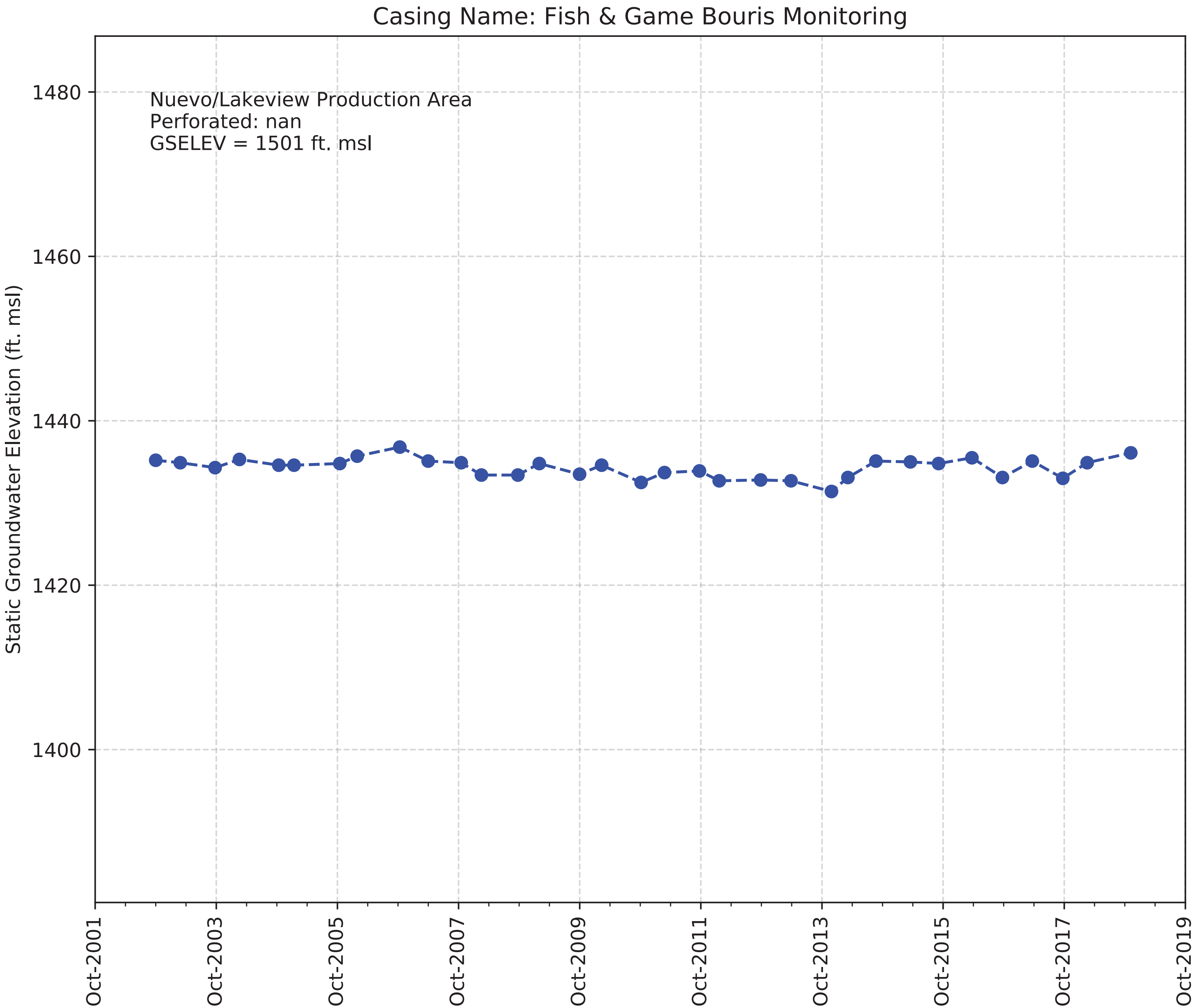

Casing Name: NWC 06
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1471 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1280
1260
1240
1220
1200
1180
1160
1140
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

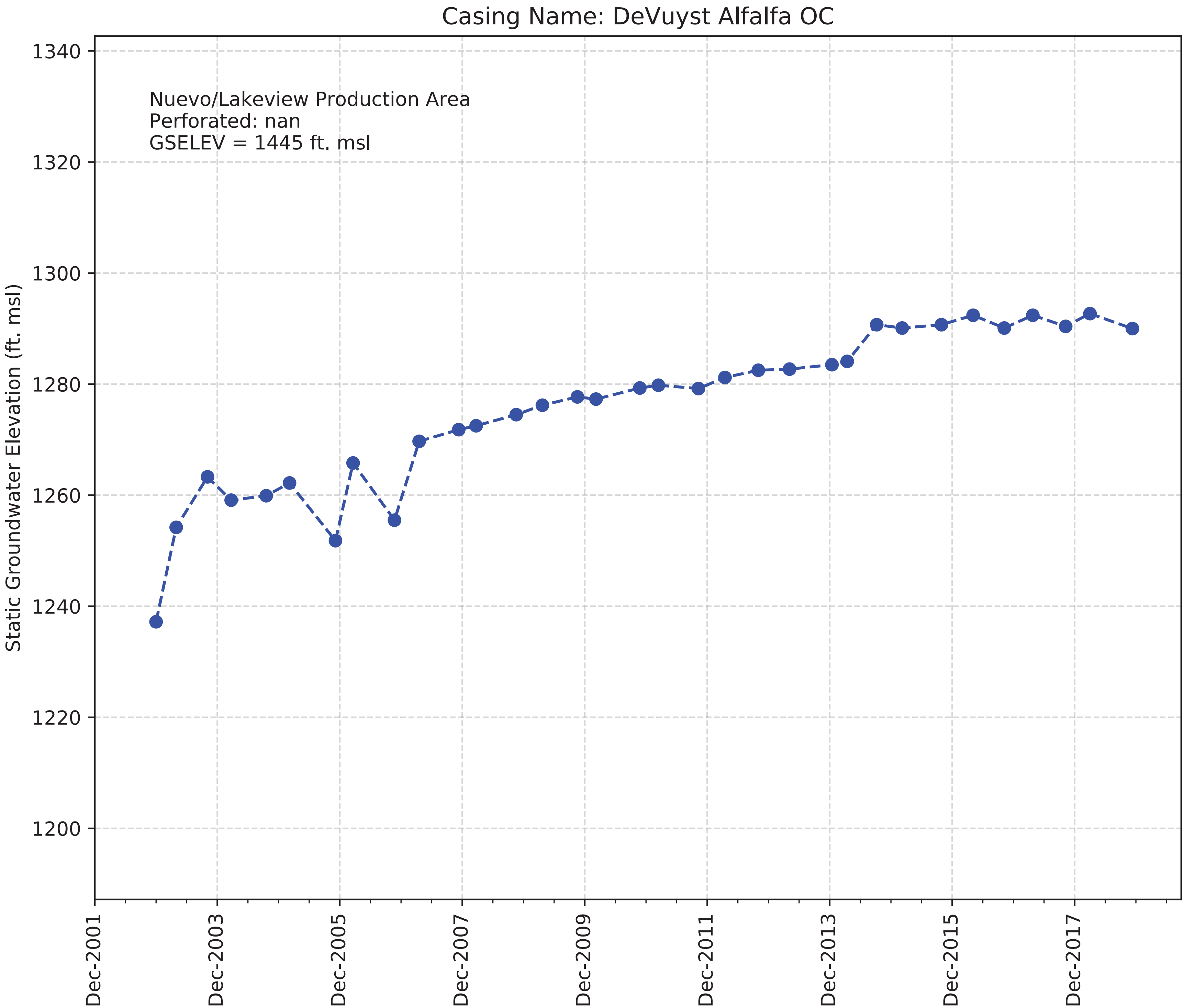

Casing Name: NWC Archibek aka Piester Well
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1472 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1350
1300
1250
1200
1150
Jan-1947
Jan-1949
Jan-1951
Jan-1953
Jan-1955
Jan-1957
Jan-1959
Jan-1961
Jan-1963
Jan-1965
Jan-1967
Jan-1969
Jan-1971
Jan-1973
Jan-1975
Jan-1977
Jan-1979
Jan-1981
Jan-1983
Jan-1985
Jan-1987
Jan-1989
Jan-1991
Jan-1993
Jan-1995
Jan-1997
Jan-1999
Jan-2001
Jan-2003
Jan-2005
Jan-2007
Jan-2009
Jan-2011
Jan-2013
Jan-2015
Jan-2017
Jan-2019

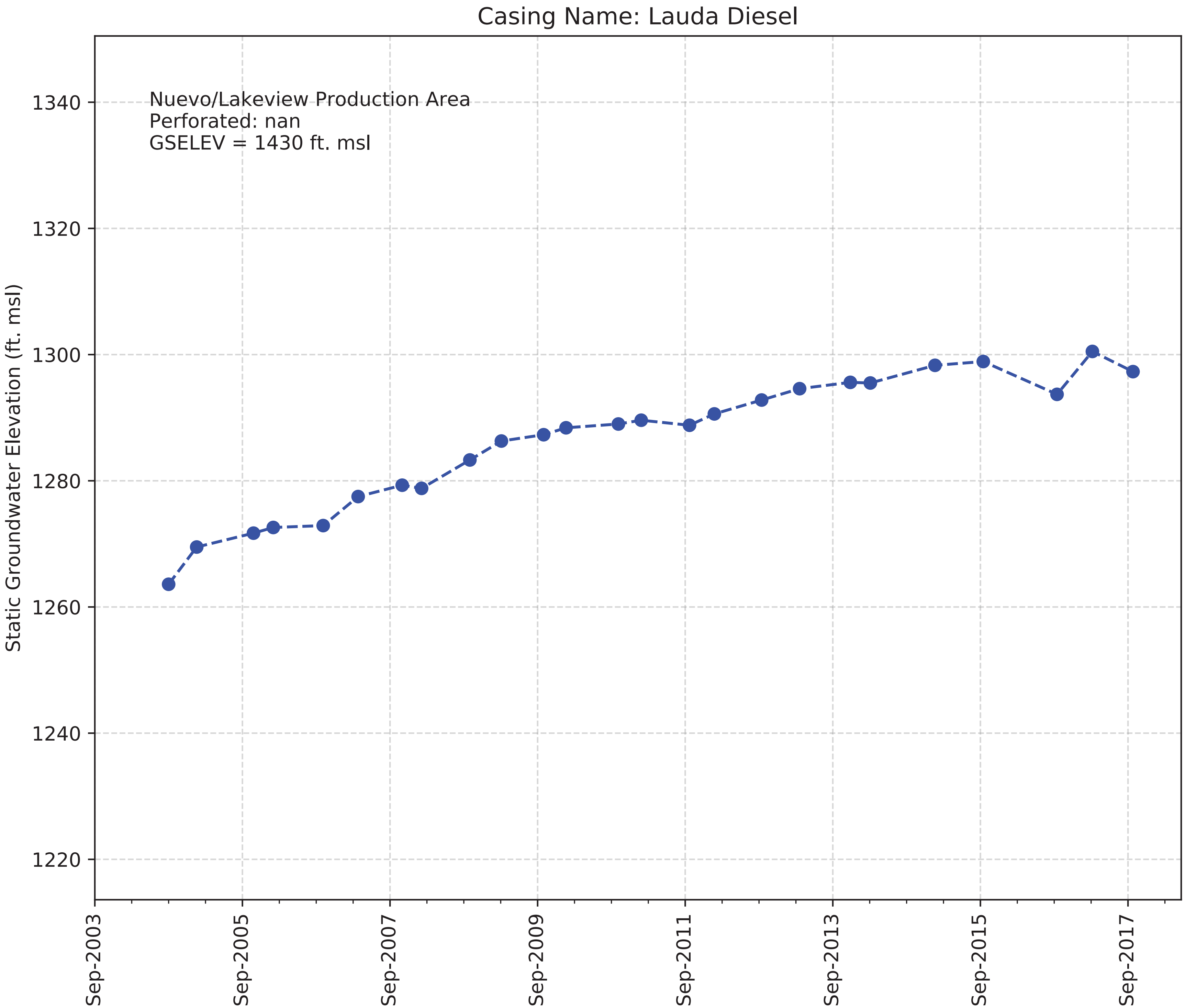

Casing Name: Ybarrola
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1440 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1275
1250
1225
1200
1175
1150
1125
Nov-1994
Nov-1996
Nov-1998
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008

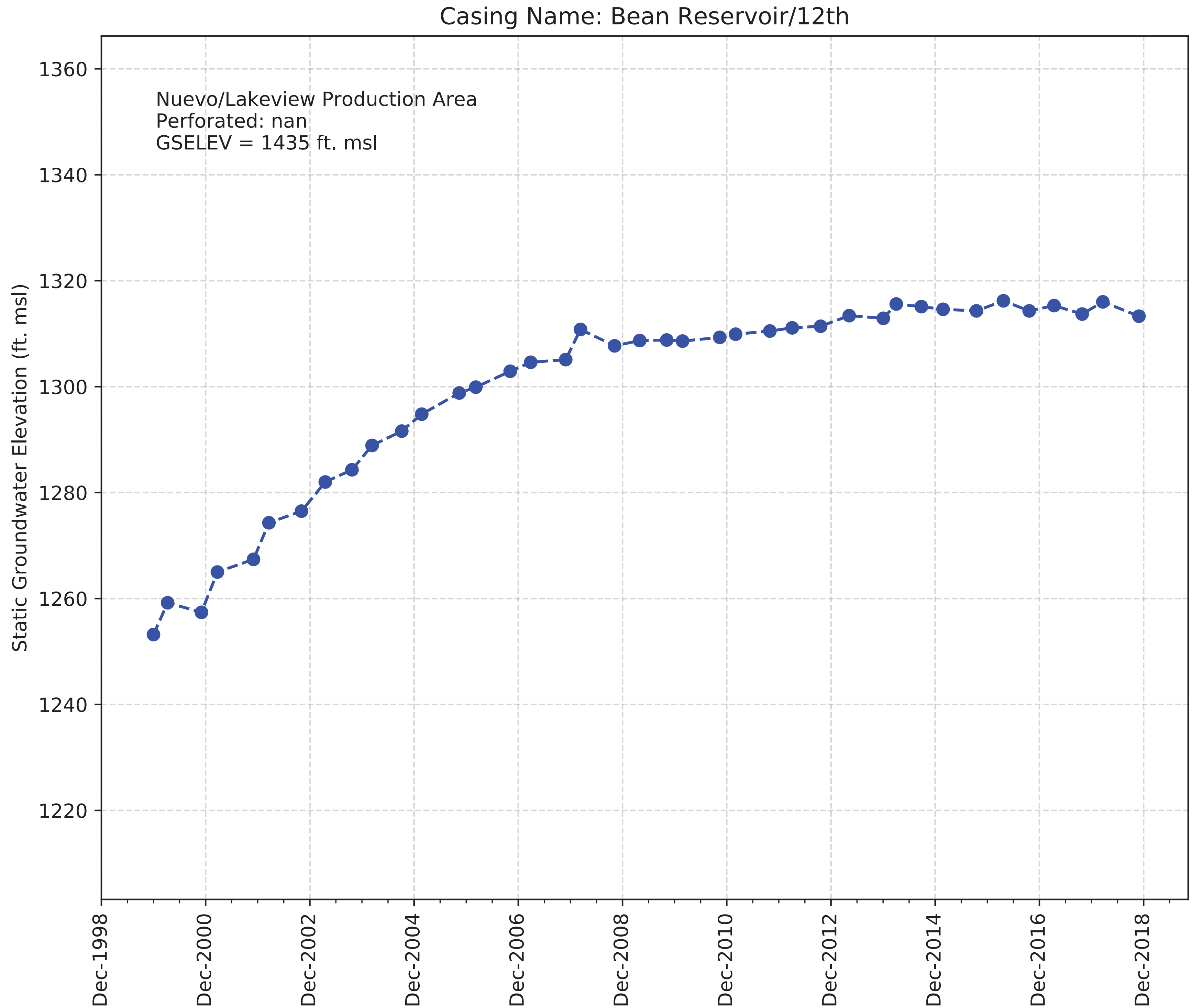

Casing Name: Smith C Nuevo/Olivas
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1453 ft. msl
Static Groundwater Elevation (ft. msl)
1375
1350
1325
1300
1275
1250
1225
Nov-1994
Nov-1996
Nov-1998
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008
Nov-2010
Nov-2012
Nov-2014
Nov-2016
Nov-2018

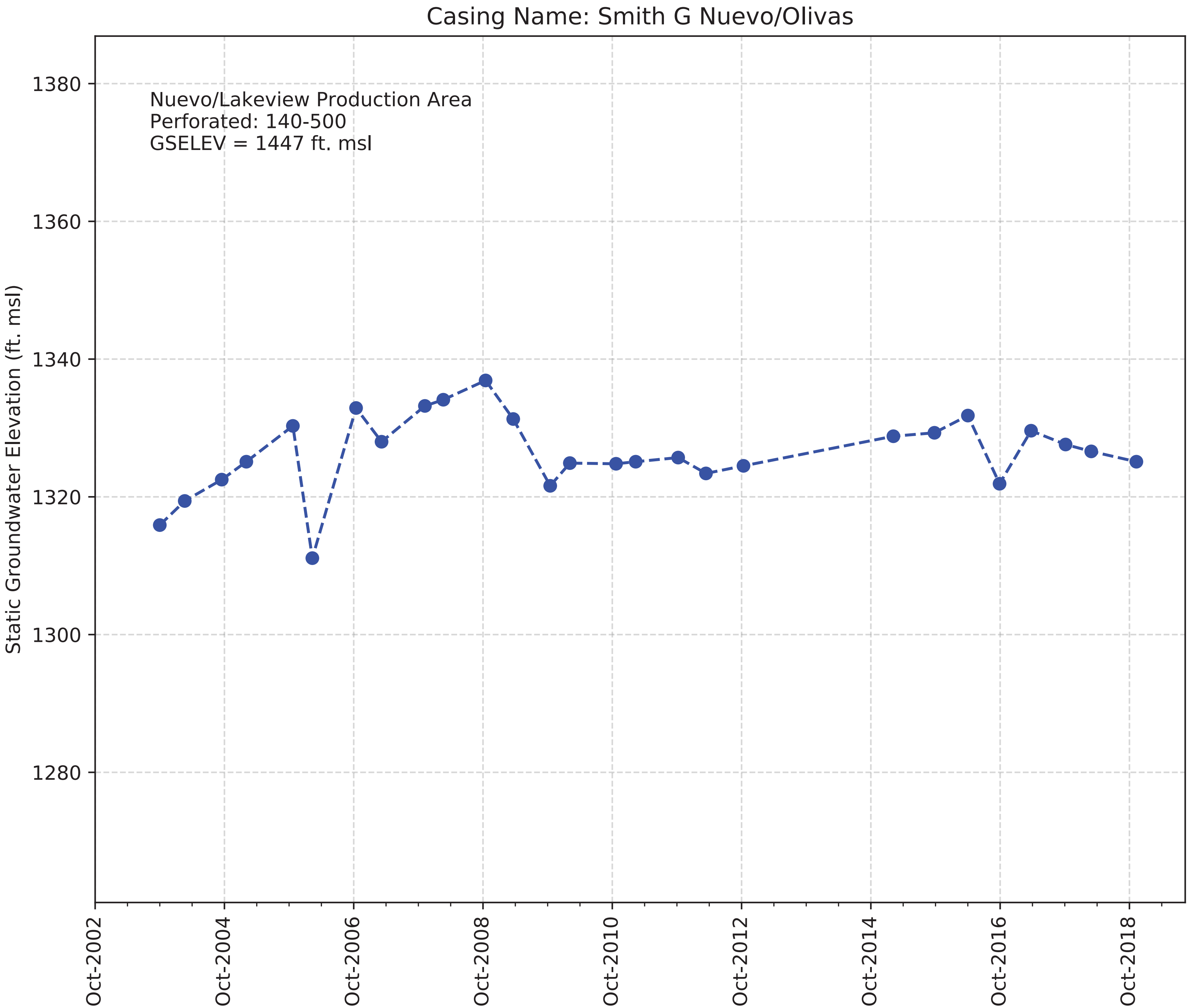

Casing Name: Fish & Game Bouris
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1495 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1300
1320
1340
1360
1380
1400
Oct-2001
Oct-2003
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017
Oct-2019

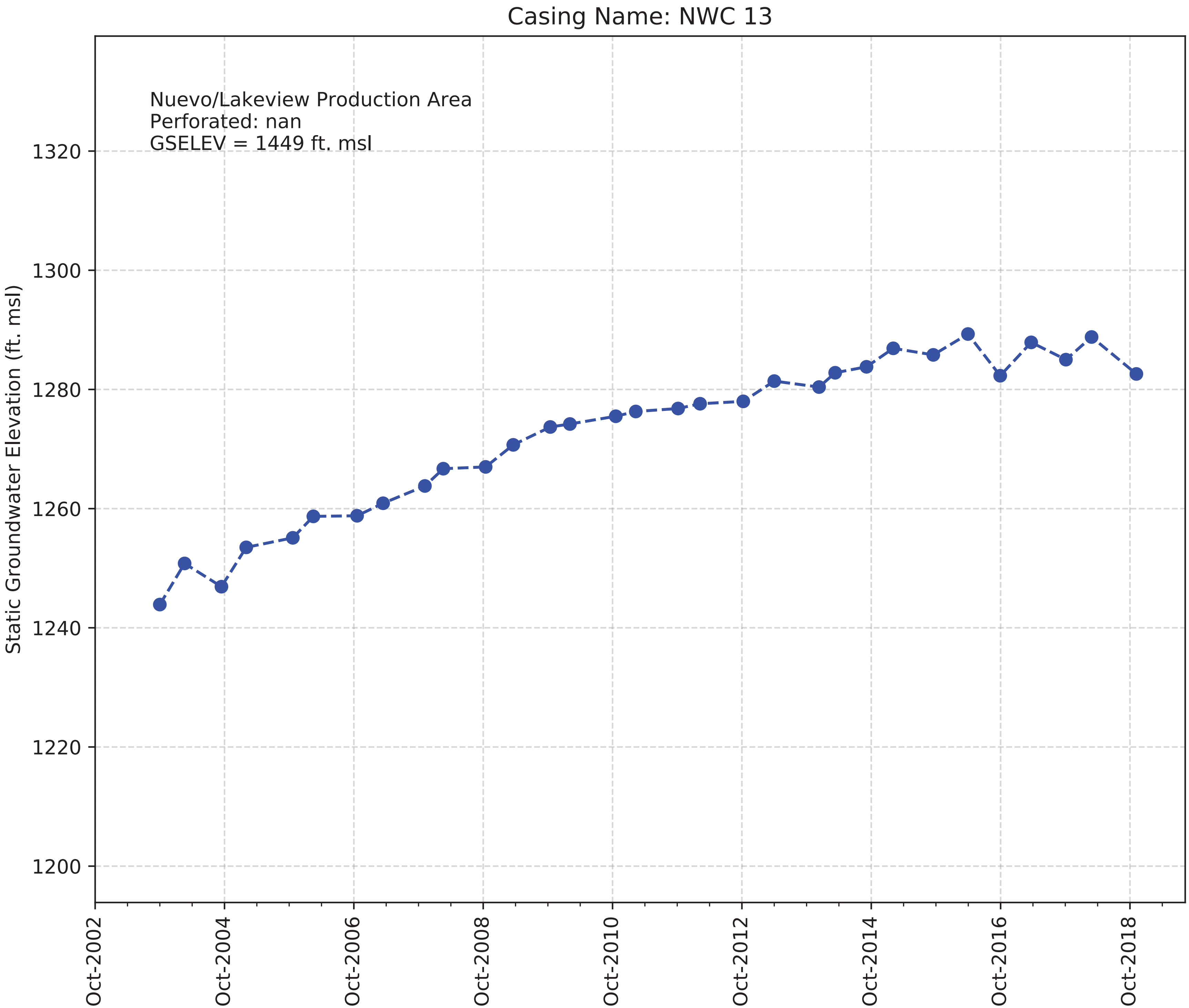

Casing Name: Fish & Game Bouris Monitoring
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1501 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
Oct-2001
Oct-2003
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017
Oct-2019

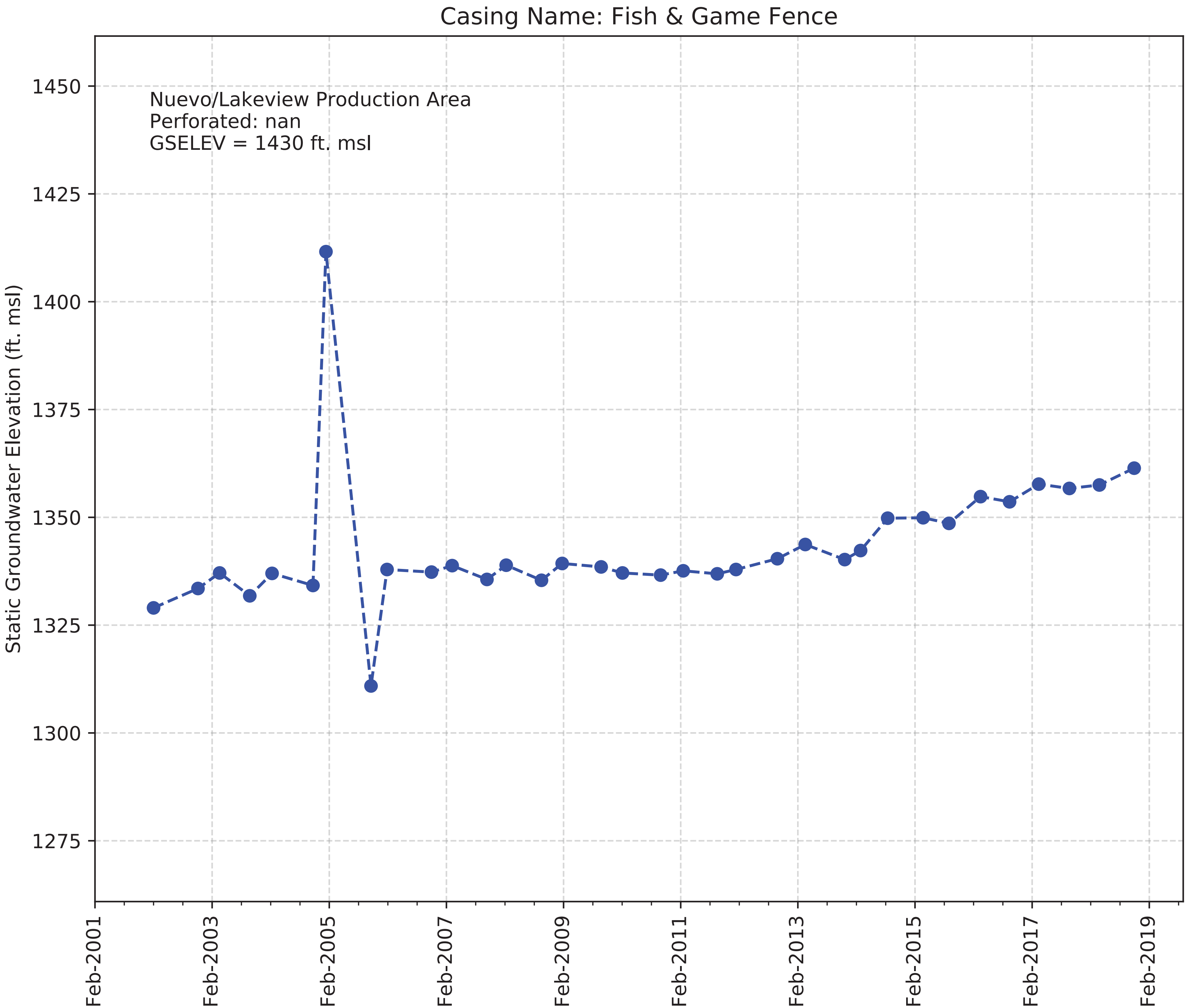

Casing Name: DeVuyst Alfalfa OC
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1445 ft. msl
Static Groundwater Elevation (ft. msl)
1340
1320
1300
1280
1260
1240
1220
1200
Dec-2001
Dec-2003
Dec-2005
Dec-2007
Dec-2009
Dec-2011
Dec-2013
Dec-2015
Dec-2017

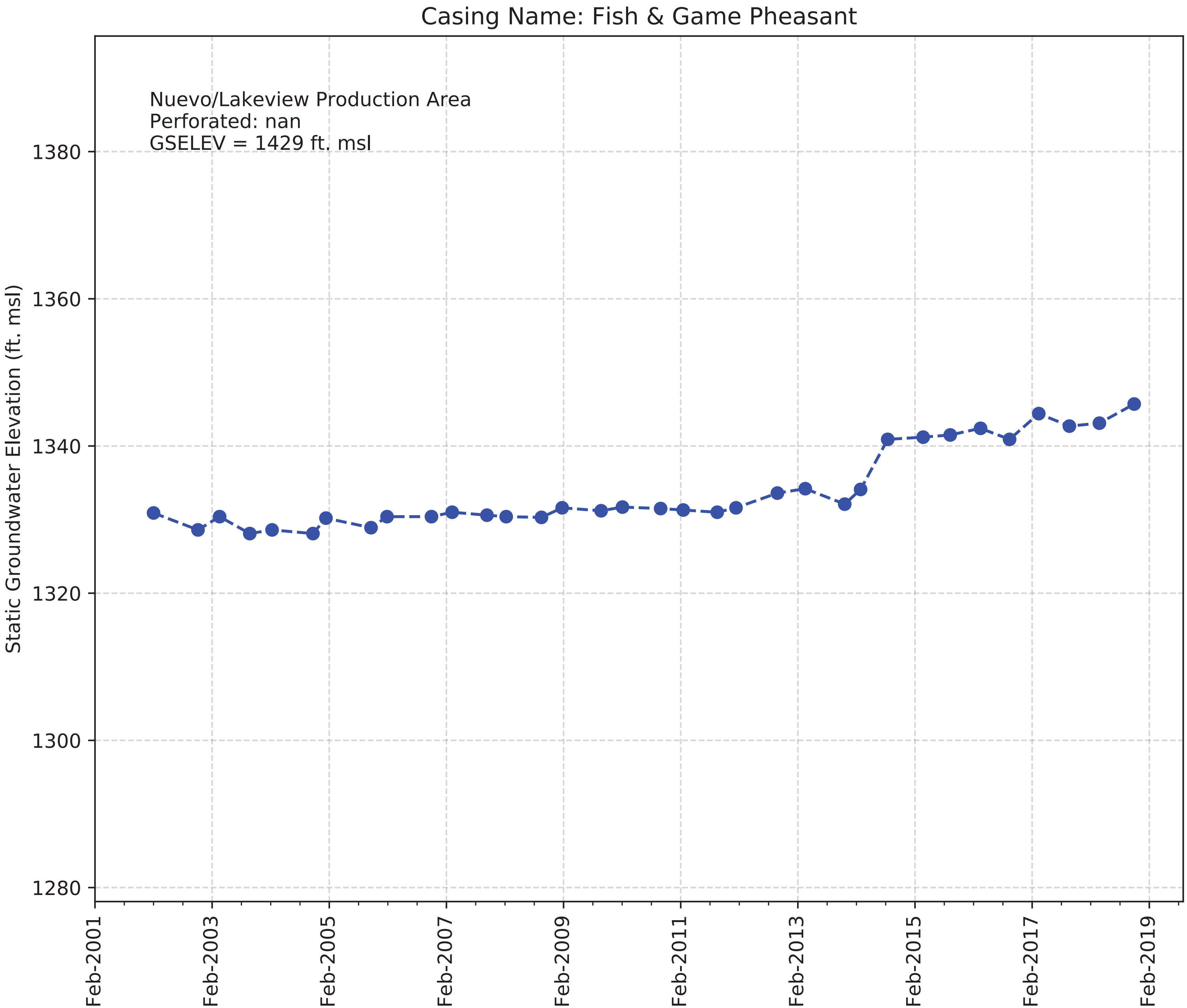

Casing Name: Lauda Diesel
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1430 ft. msl
Static Groundwater Elevation (ft. msl)
1340
1320
1300
1280
1260
1240
1220
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015
Sep-2017

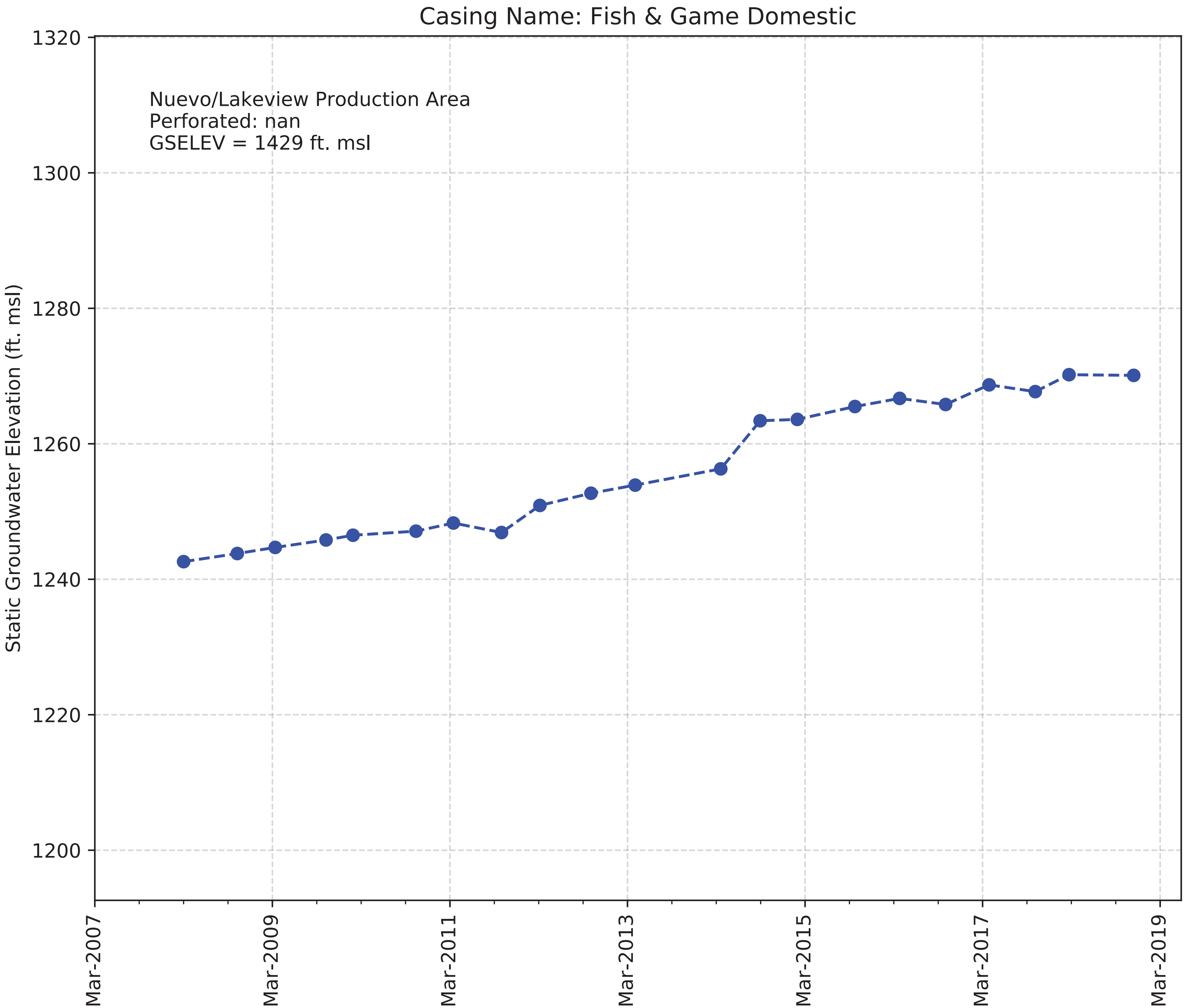

Casing Name: Bean Reservoir/12th
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1435 ft. msl
Static Groundwater Elevation (ft. msl)
1360
1340
1320
1300
1280
1260
1240
1220
Dec-1998
Dec-2000
Dec-2002
Dec-2004
Dec-2006
Dec-2008
Dec-2010
Dec-2012
Dec-2014
Dec-2016
Dec-2018

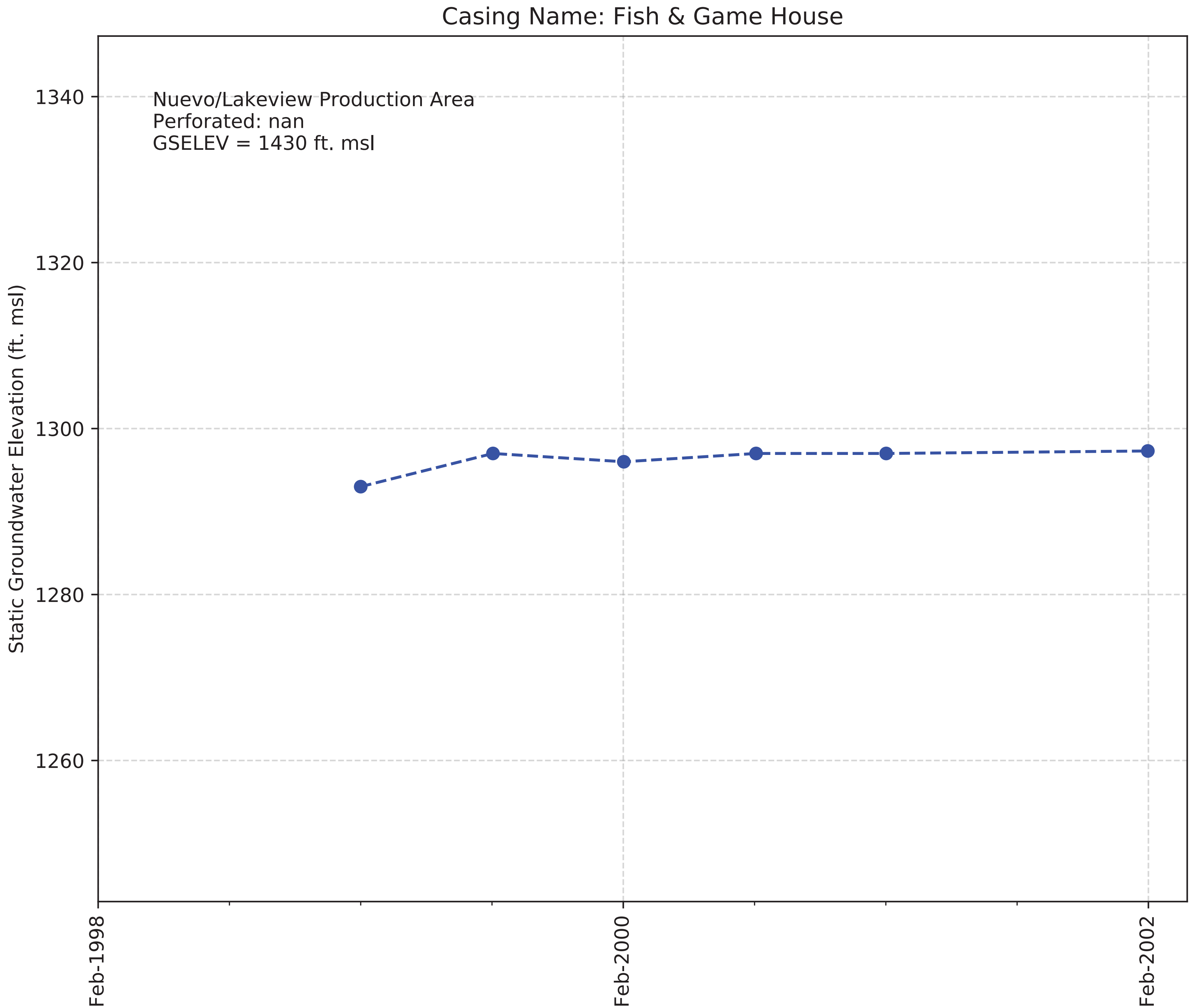

Casing Name: Smith G Nuevo/Olivas
Nuevo/Lakeview Production Area
Perforated: 140-500
GSELEV = 1447 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Oct-2002
Oct-2004
Oct-2006
Oct-2008
Oct-2010
Oct-2012
Oct-2014
Oct-2016
Oct-2018

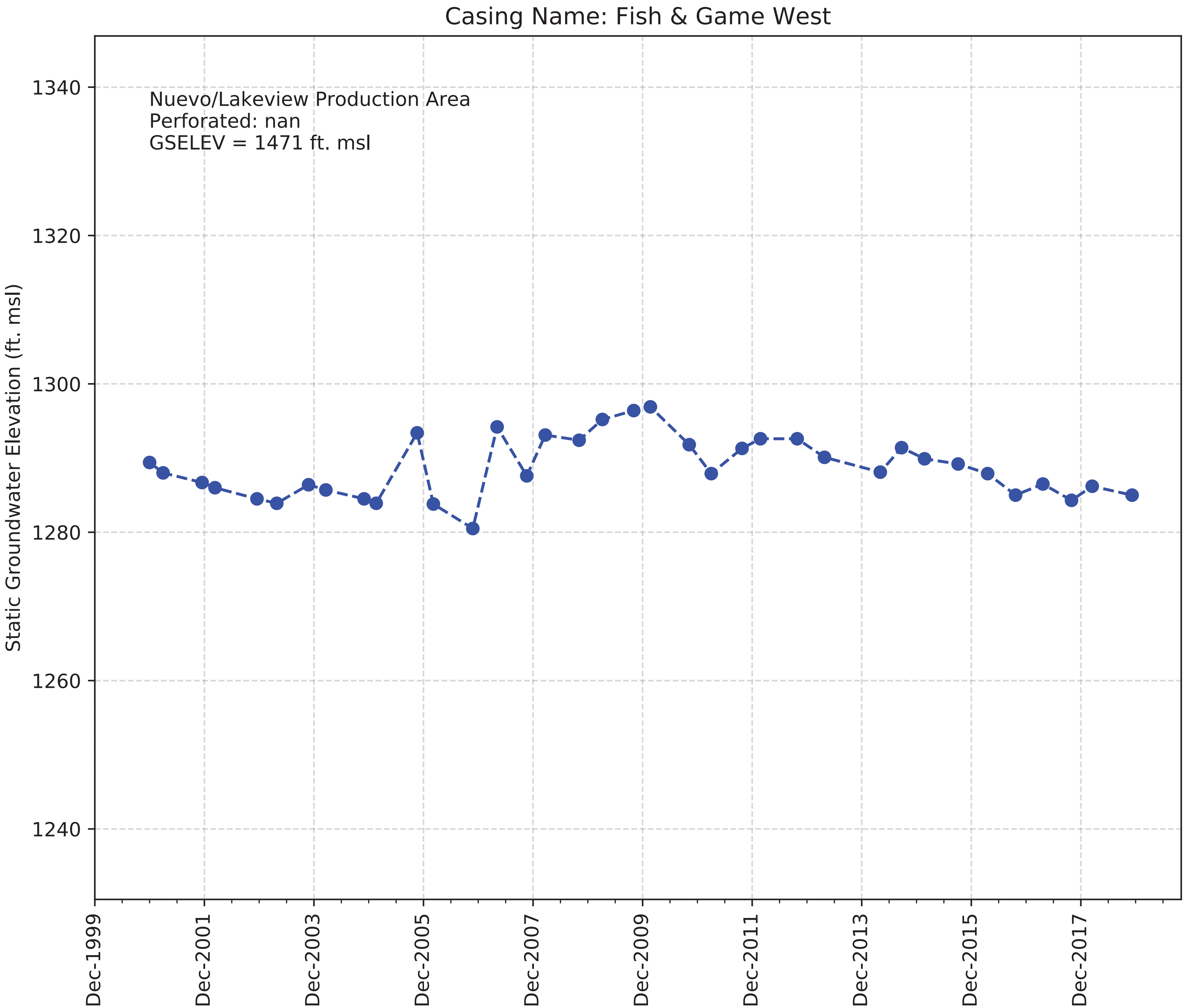

Casing Name: NWC 13
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1449 ft. msl
Static Groundwater Elevation (ft. msl)
1200
1220
1240
1260
1280
1300
1320
Oct-2002
Oct-2004
Oct-2006
Oct-2008
Oct-2010
Oct-2012
Oct-2014
Oct-2016
Oct-2018

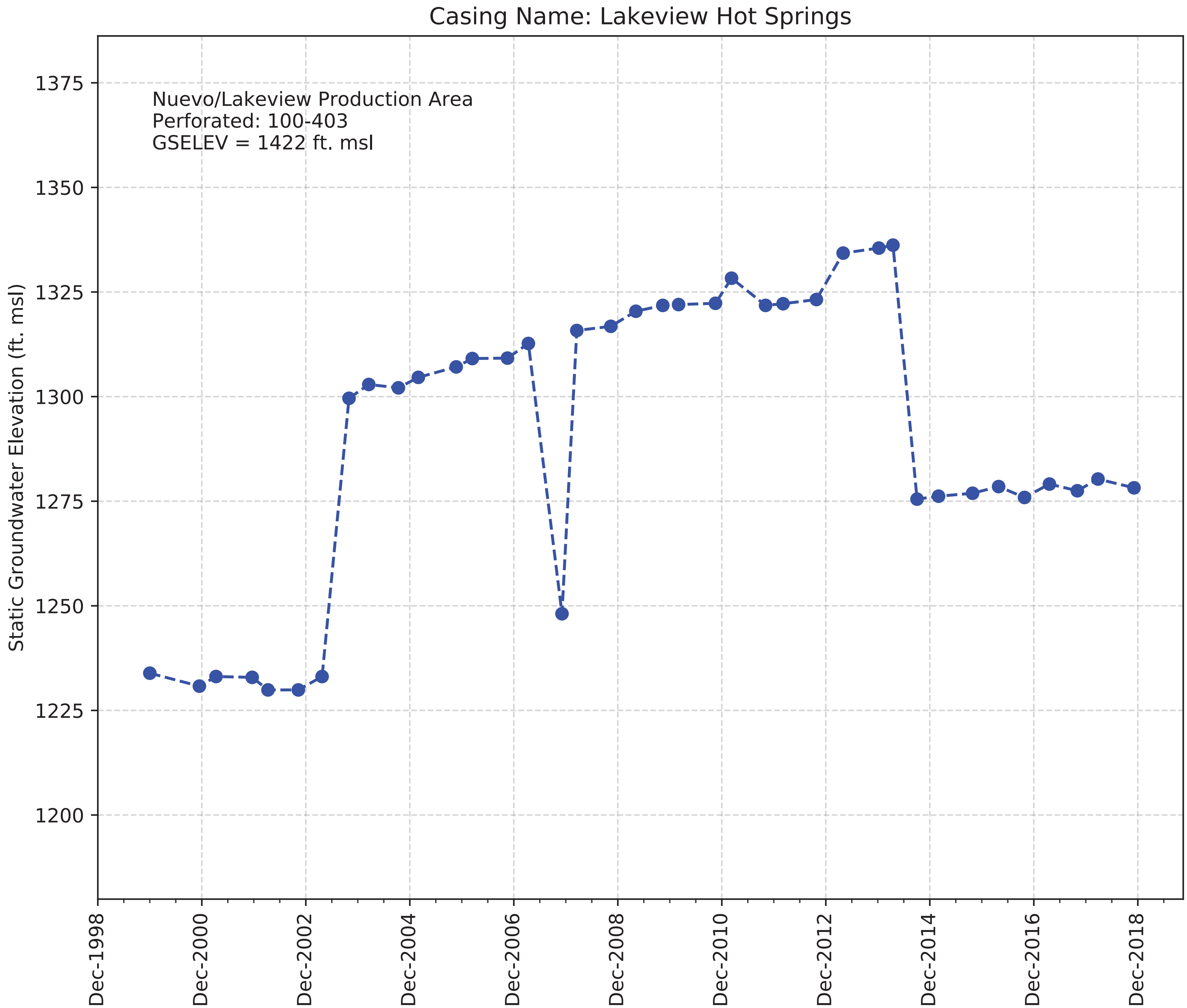

Casing Name: Fish & Game Fence
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1430 ft. msl
Static Groundwater Elevation (ft. msl)
1450
1425
1400
1375
1350
1325
1300
1275
Feb-2001
Feb-2003
Feb-2005
Feb-2007
Feb-2009
Feb-2011
Feb-2013
Feb-2015
Feb-2017
Feb-2019

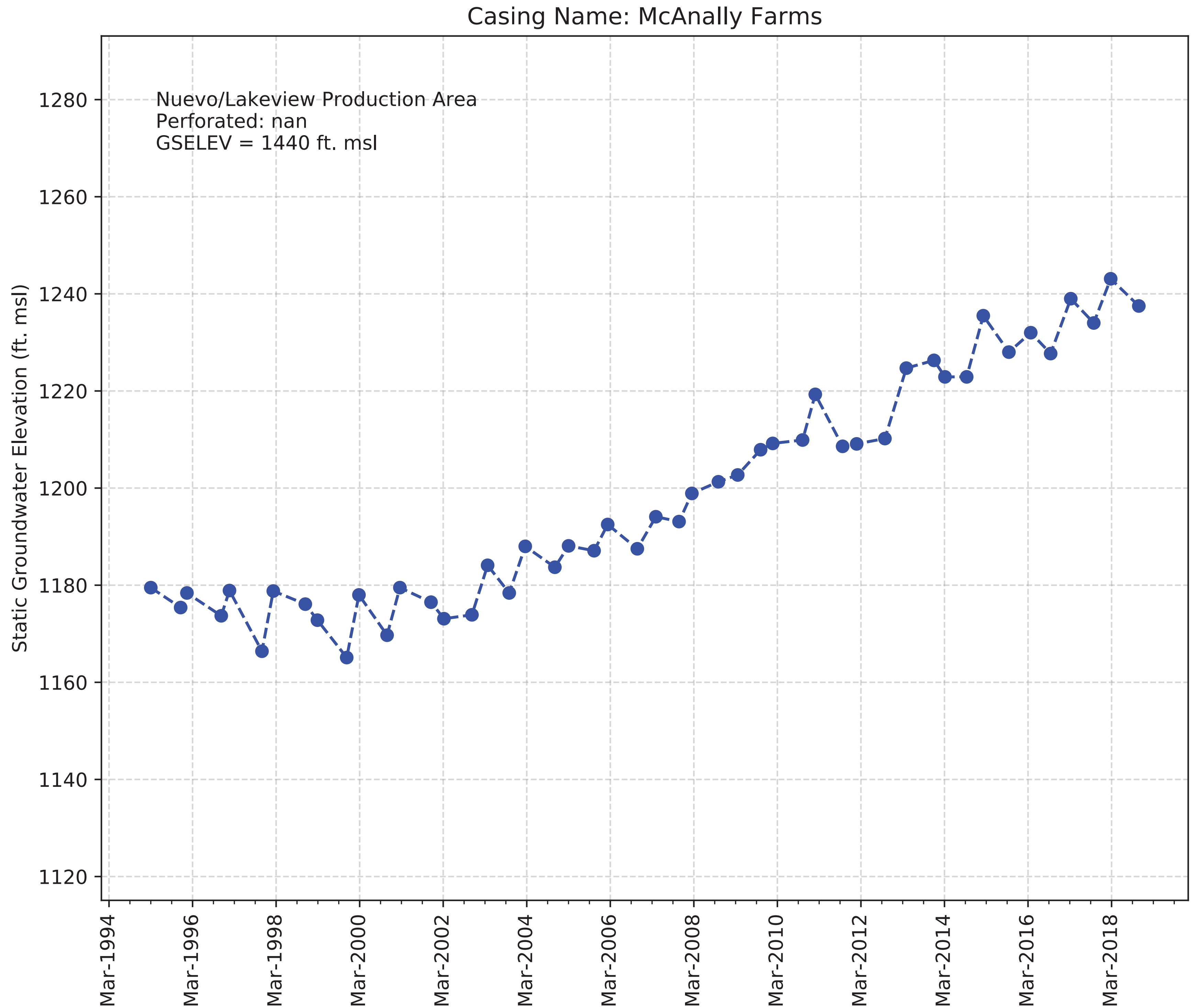

Casing Name: Fish & Game Pheasant
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Feb-2001
Feb-2003
Feb-2005
Feb-2007
Feb-2009
Feb-2011
Feb-2013
Feb-2015
Feb-2017
Feb-2019

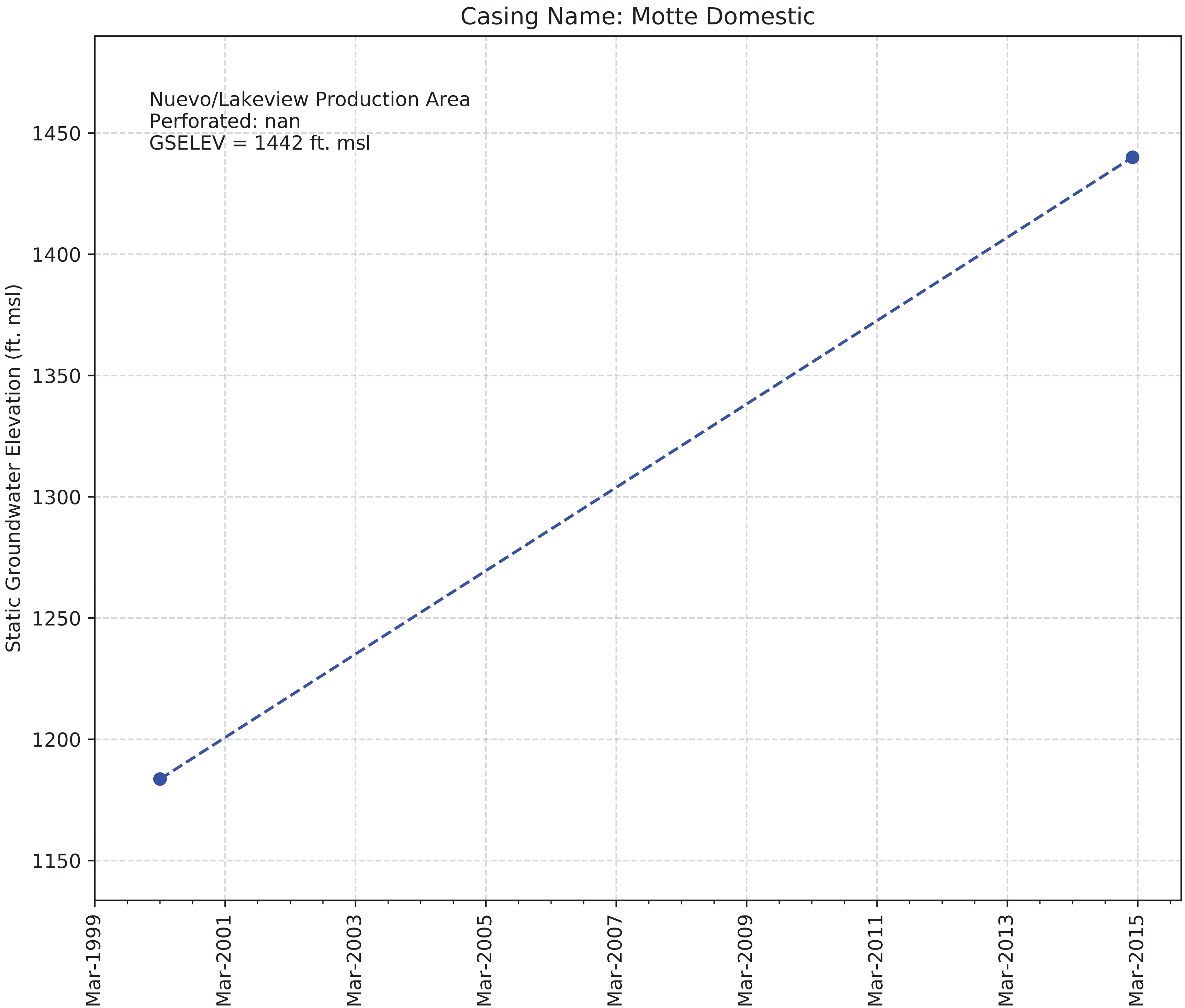

Casing Name: Fish & Game Domestic
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1320
1300
1280
1260
1240
1220
1200
Mar-2007
Mar-2009
Mar-2011
Mar-2013
Mar-2015
Mar-2017
Mar-2019

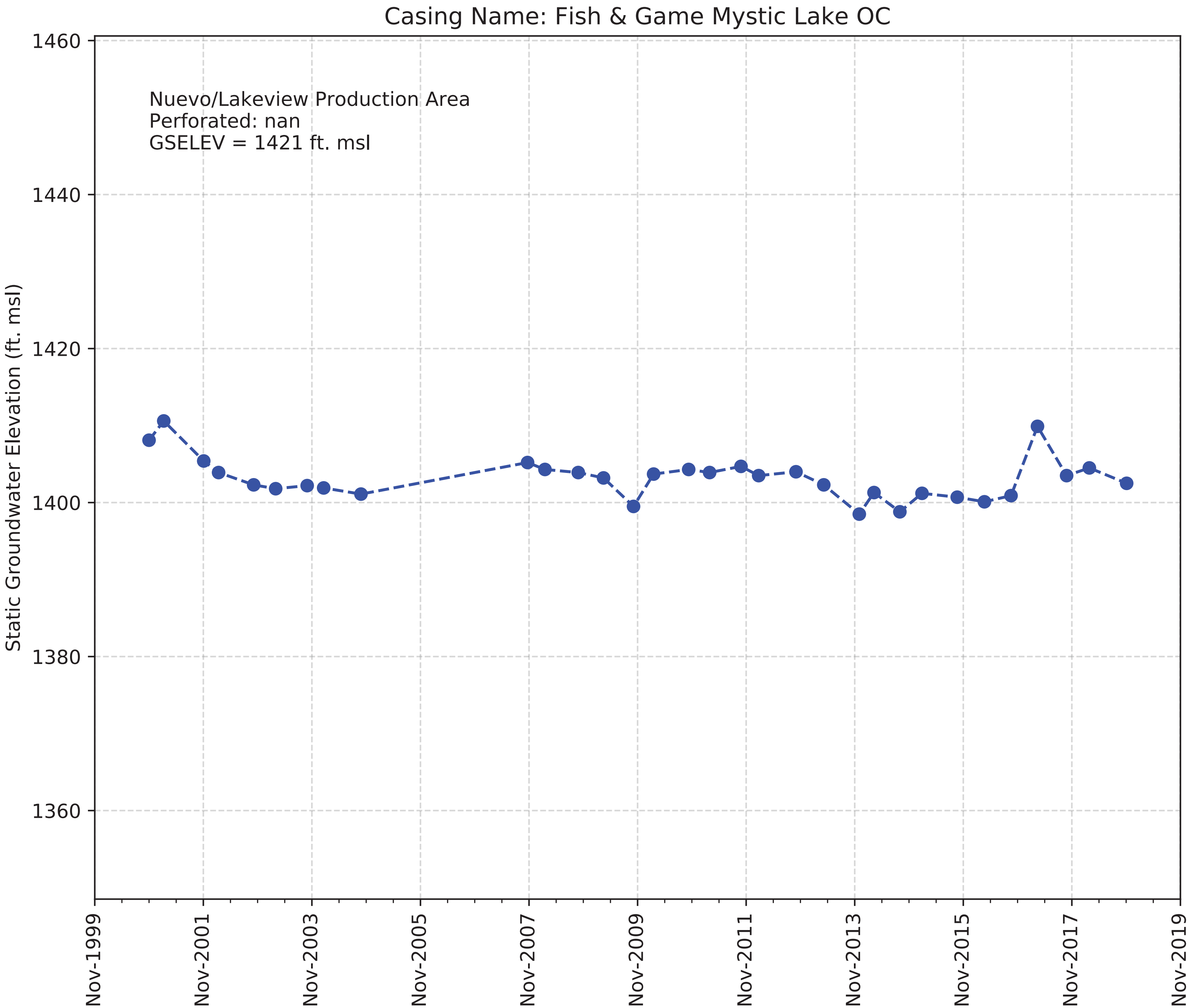

Casing Name: Fish & Game House
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1430 ft. msl
Static Groundwater Elevation (ft. msl)
1340
1320
1300
1280
1260
Feb-1998
Feb-2000
Feb-2002

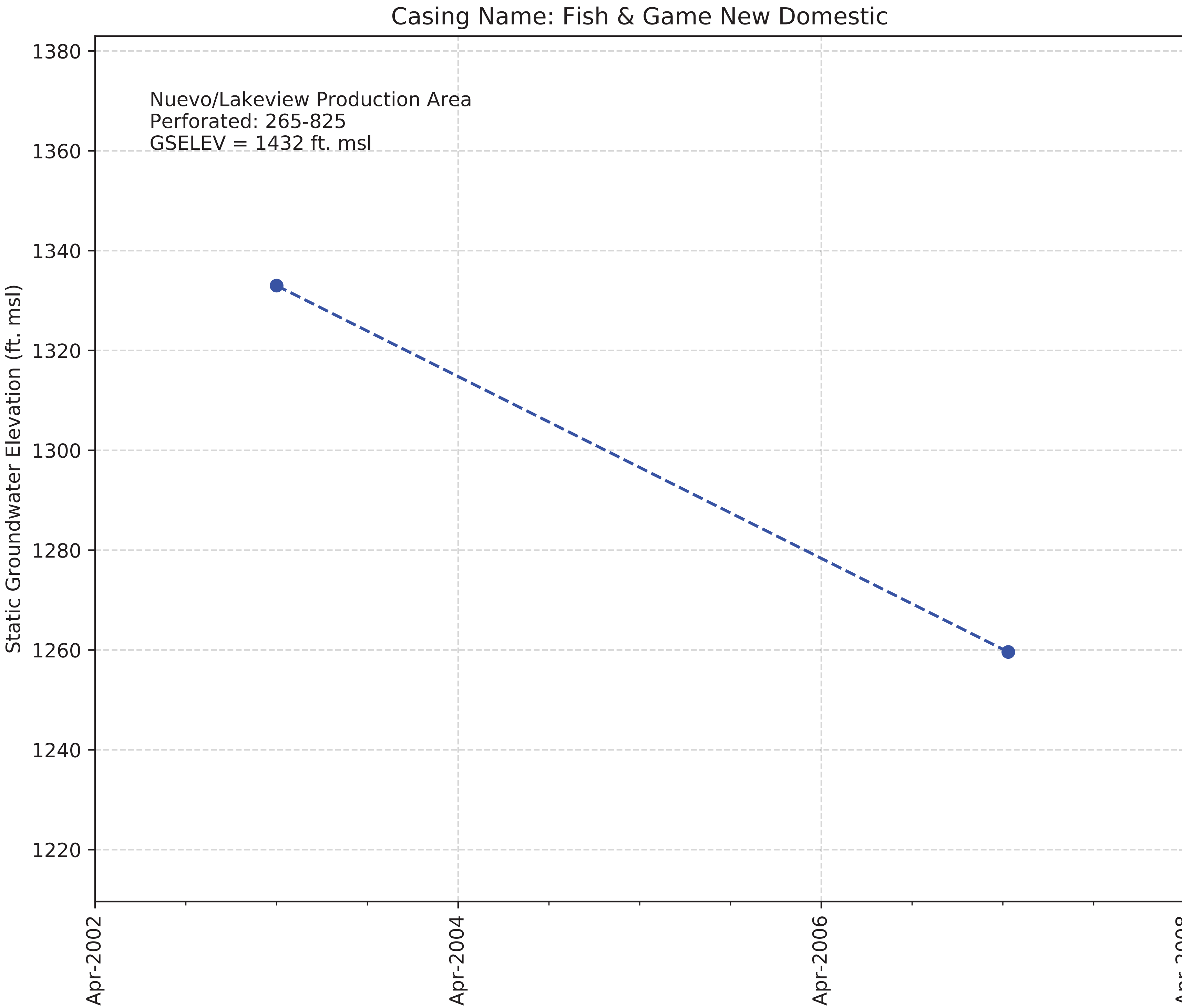

Casing Name: Fish & Game West
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1471 ft. msl
Static Groundwater Elevation (ft. msl)
1340
1320
1300
1280
1260
1240
Dec-1999
Dec-2001
Dec-2003
Dec-2005
Dec-2007
Dec-2009
Dec-2011
Dec-2013
Dec-2015
Dec-2017

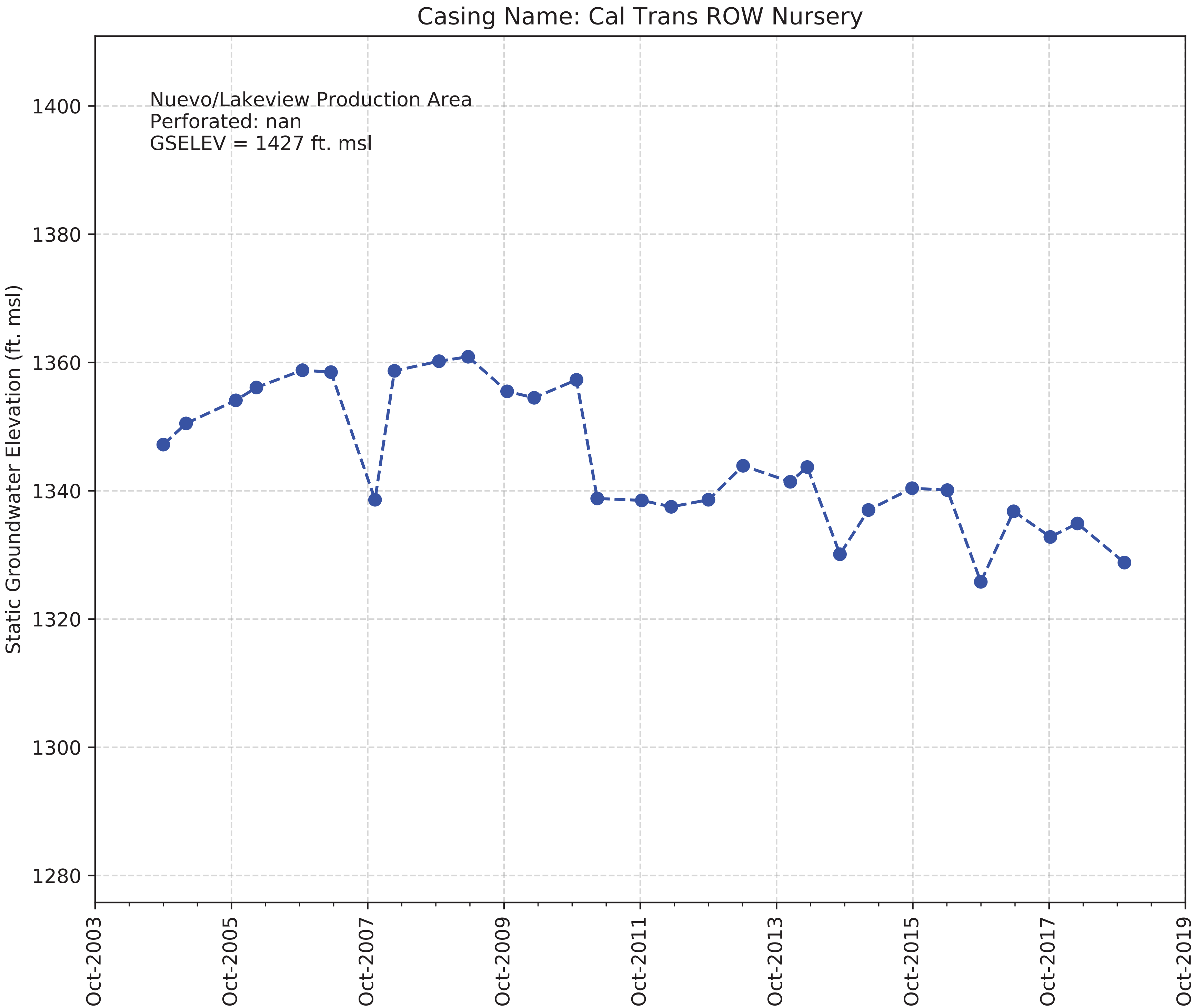

Casing Name: Lakeview Hot Springs
Nuevo/Lakeview Production Area
Perforated: 100-403
GSELEV = 1422 ft. msl
Static Groundwater Elevation (ft. msl)
1375
1350
1325
1300
1275
1250
1225
1200
Dec-1998
Dec-2000
Dec-2002
Dec-2004
Dec-2006
Dec-2008
Dec-2010
Dec-2012
Dec-2014
Dec-2016
Dec-2018

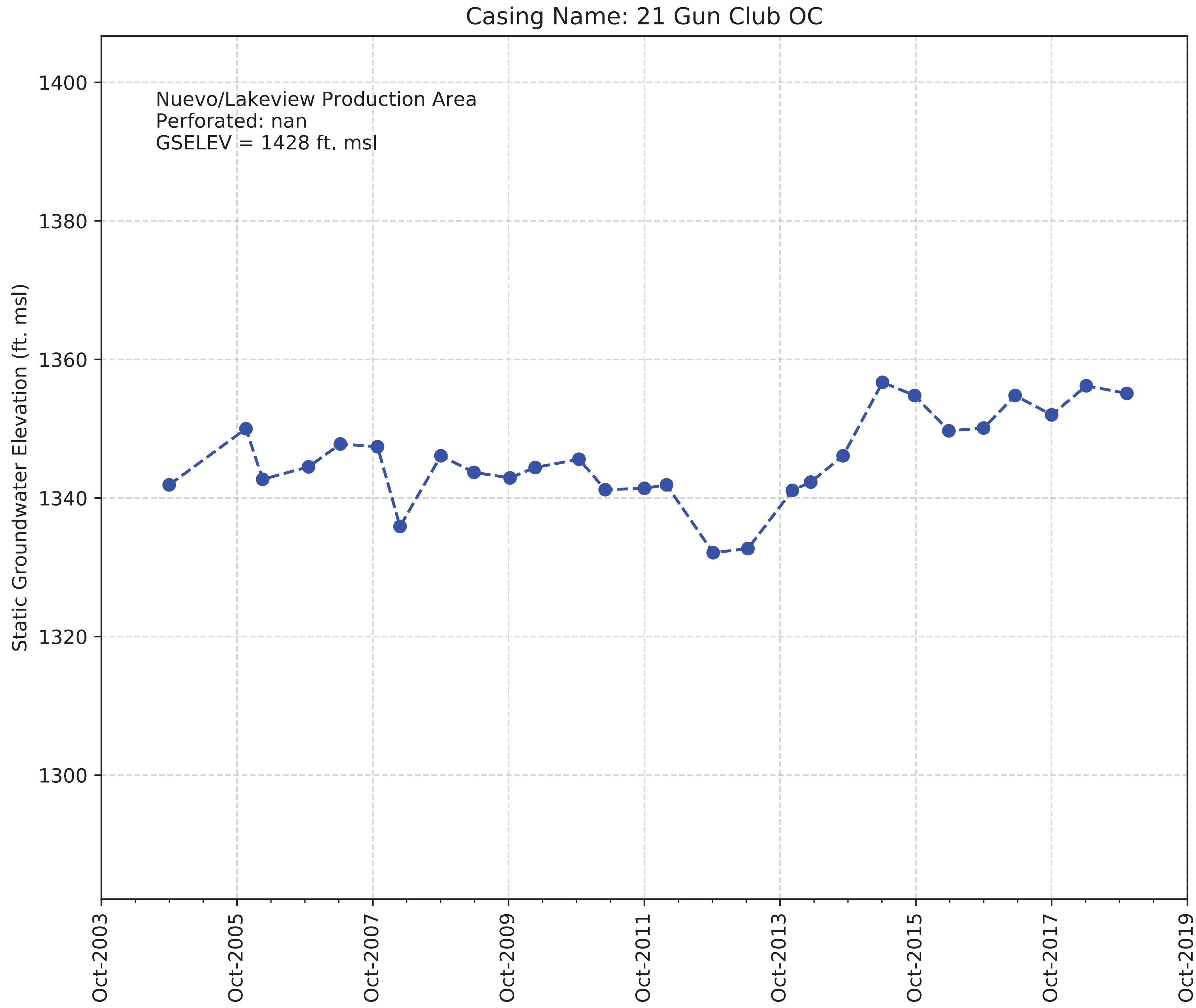

Casing Name: McAnally Farms
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1440 ft. msl
Static Groundwater Elevation (ft. msl)
1120
1140
1160
1180
1200
1220
1240
1260
1280
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

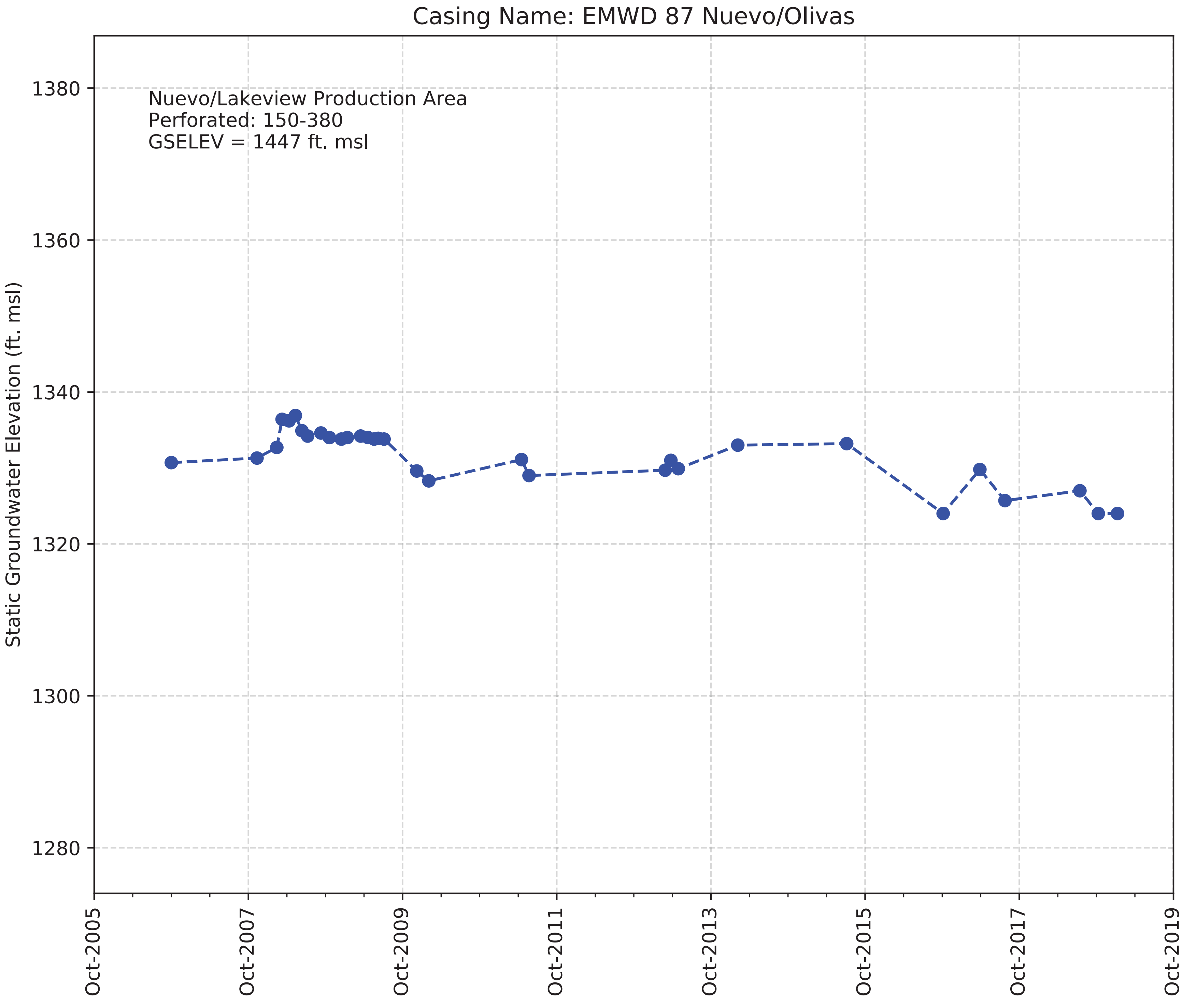

Casing Name: Motte Domestic
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1442 ft. msl
Static Groundwater Elevation (ft. msl)
1450
1400
1350
1300
1250
1200
1150
Mar-1999
Mar-2001
Mar-2003
Mar-2005
Mar-2007
Mar-2009
Mar-2011
Mar-2013
Mar-2015

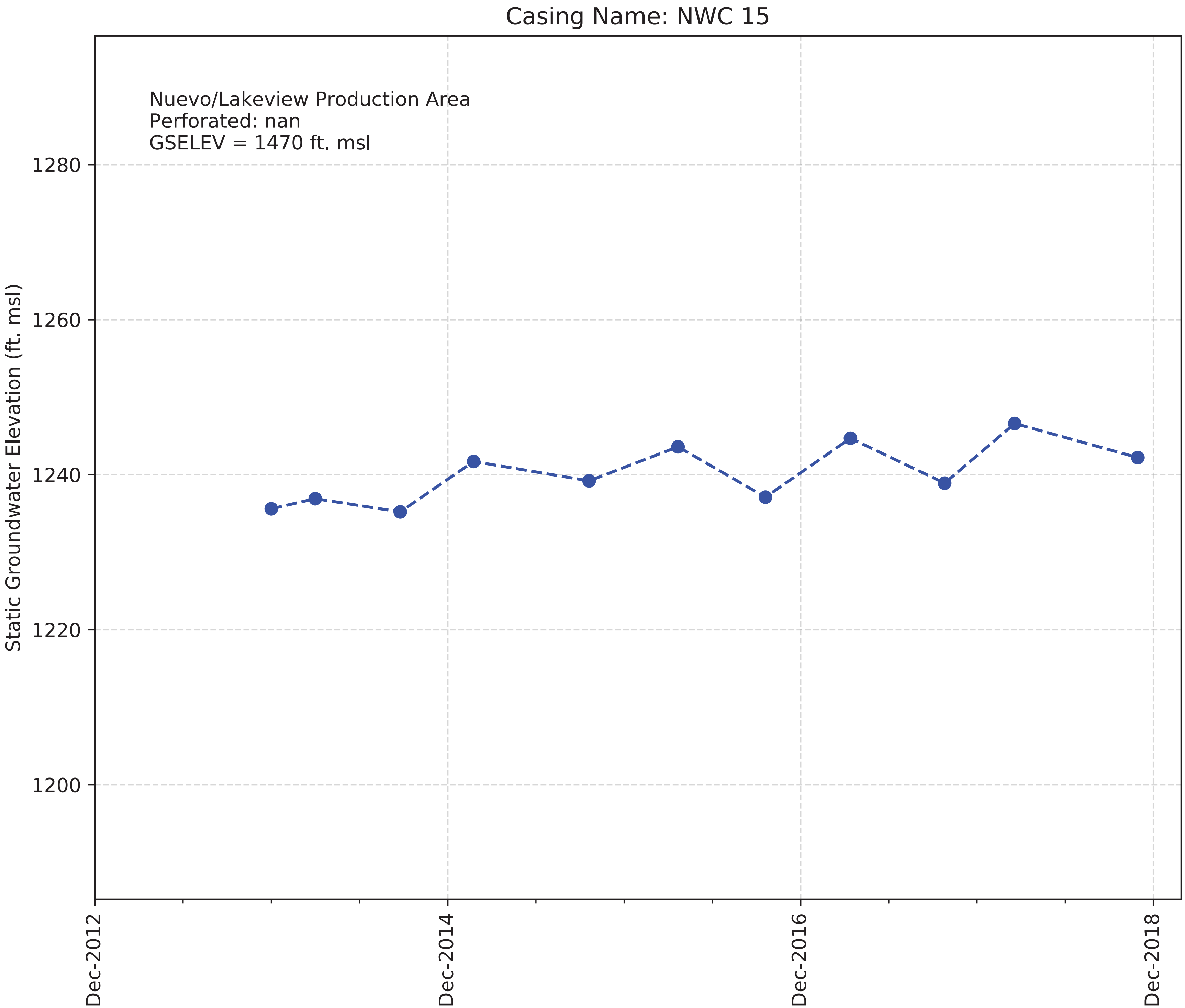

Casing Name: Fish & Game Mystic Lake OC
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1421 ft. msl
Static Groundwater Elevation (ft. msl)
1460
1440
1420
1400
1380
1360
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017
Nov-2019

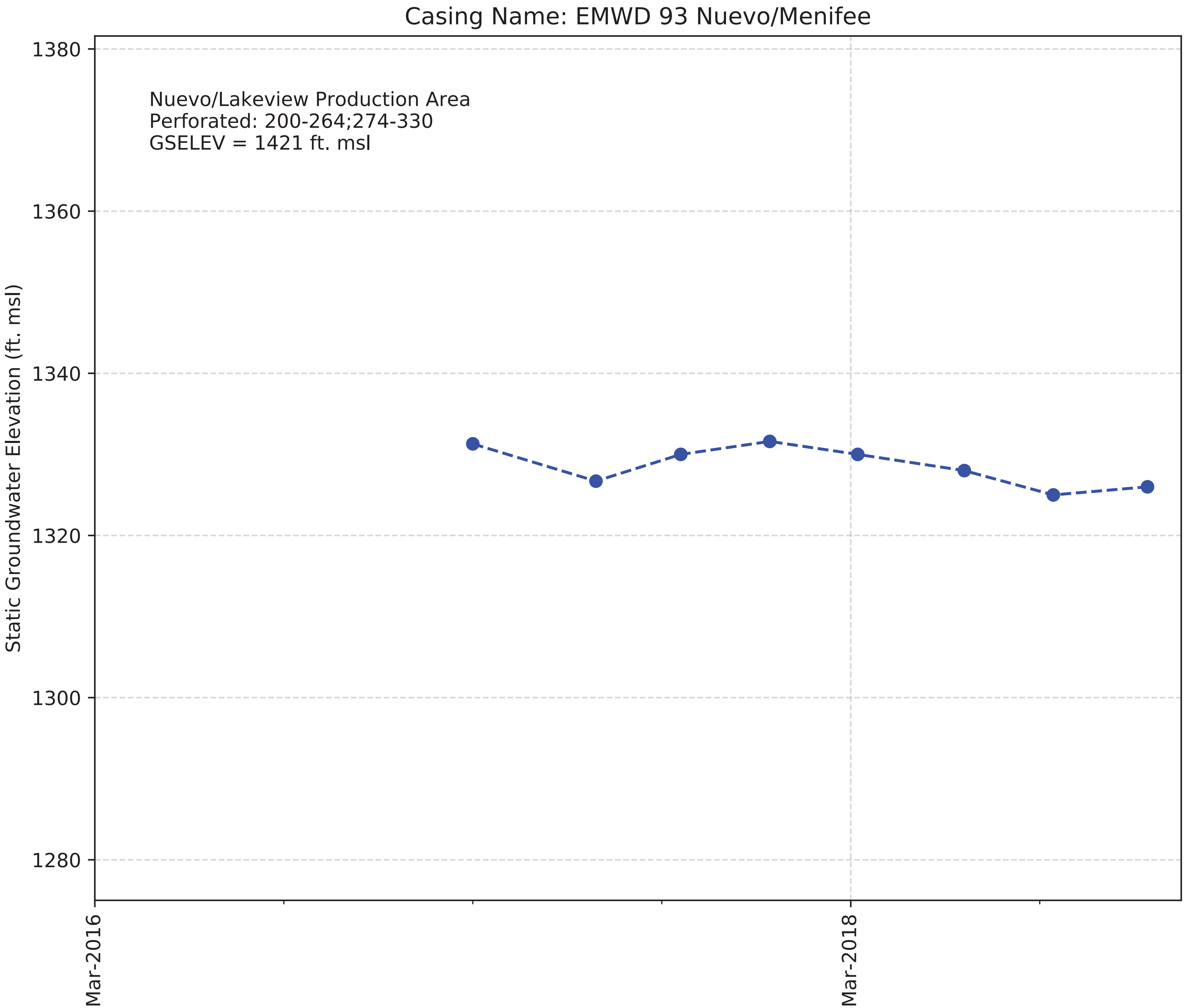

Casing Name: Fish & Game New Domestic
Nuevo/Lakeview Production Area
Perforated: 265-825
GSELEV = 1432 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
1260
1240
1220
Apr-2002
Apr-2004
Apr-2006
Apr-2008

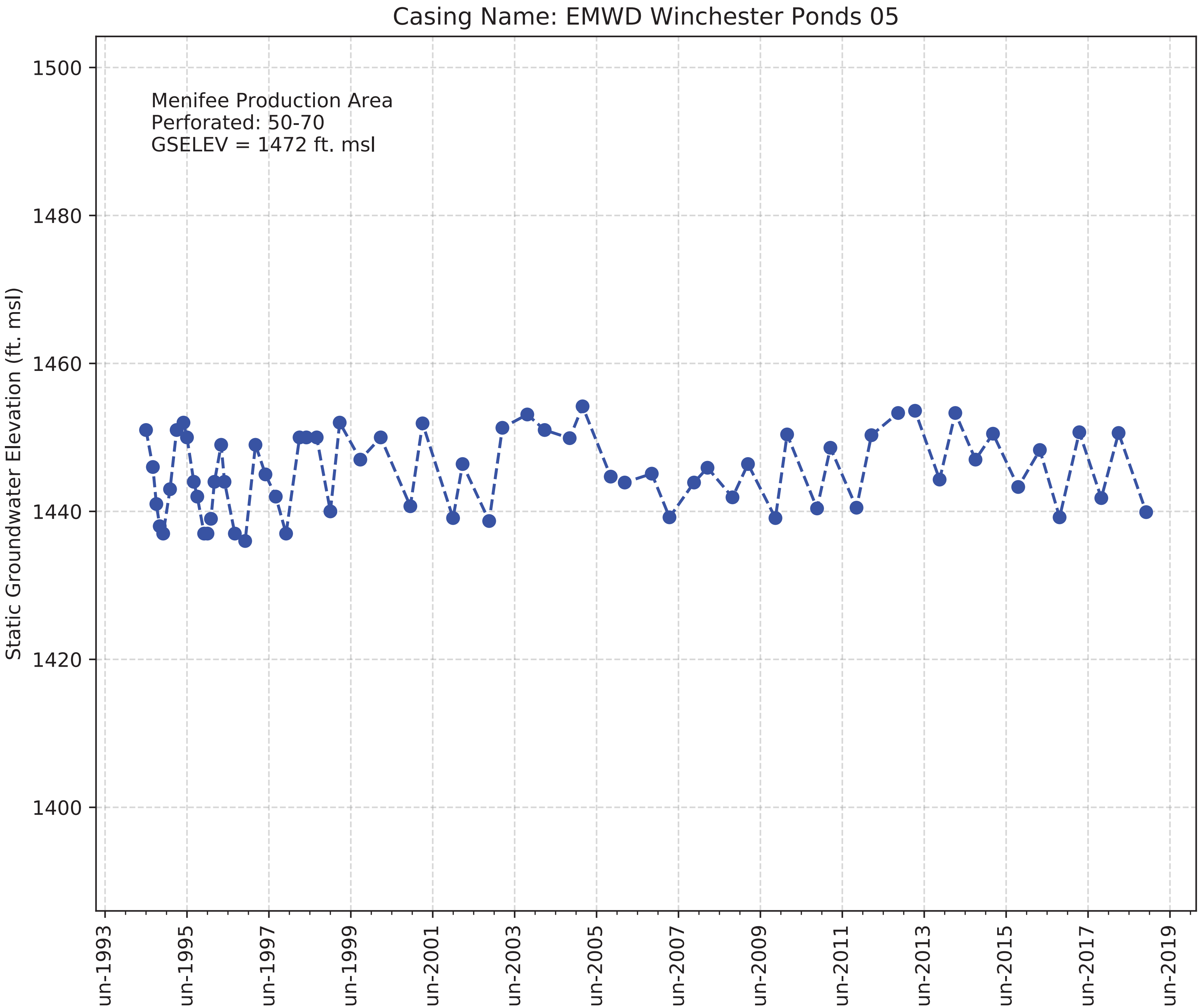

Casing Name: Cal Trans ROW Nursery
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1427 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
Oct-2003
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017
Oct-2019

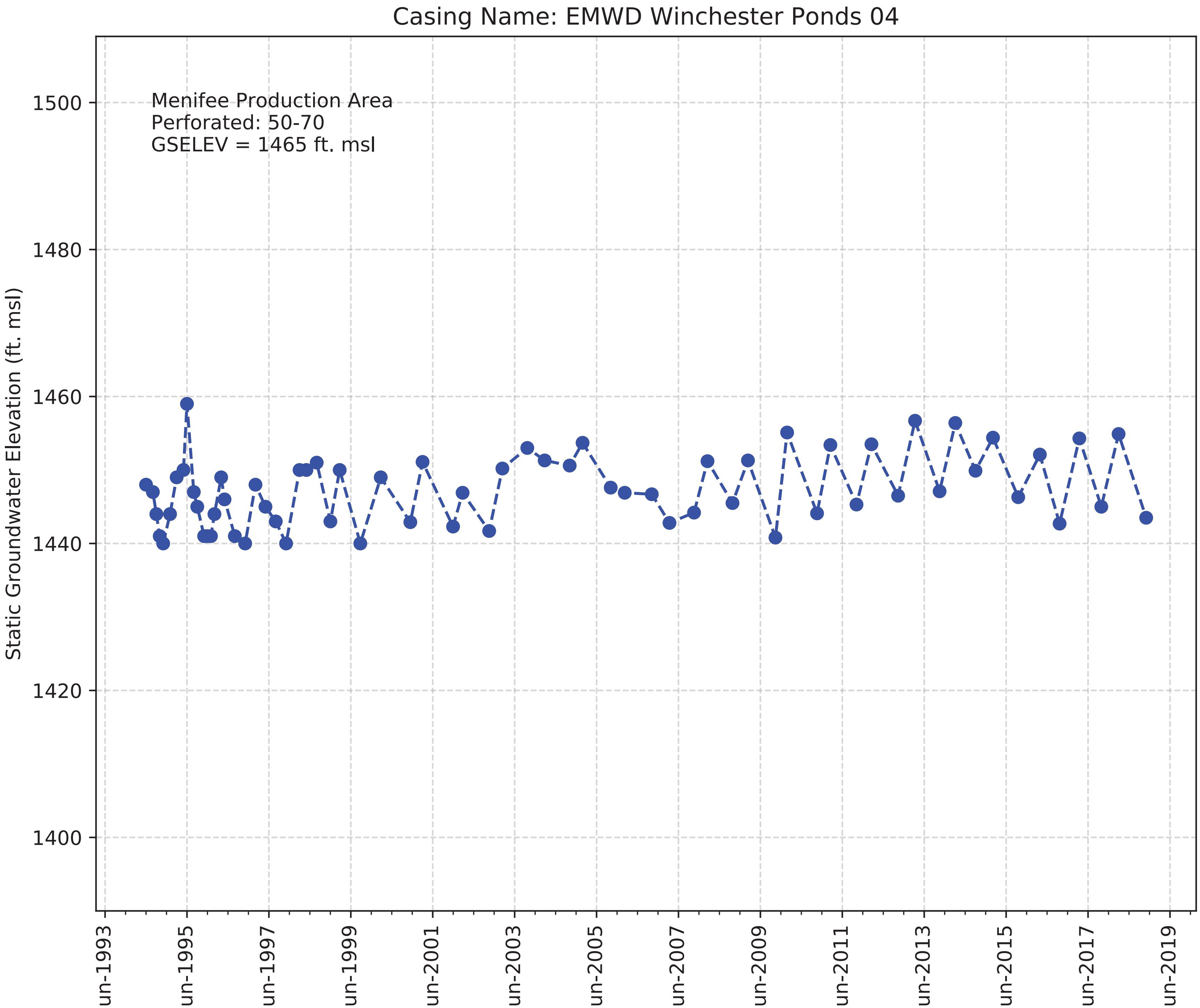

Casing Name: 21 Gun Club OC
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
Oct-2003
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017
Oct-2019

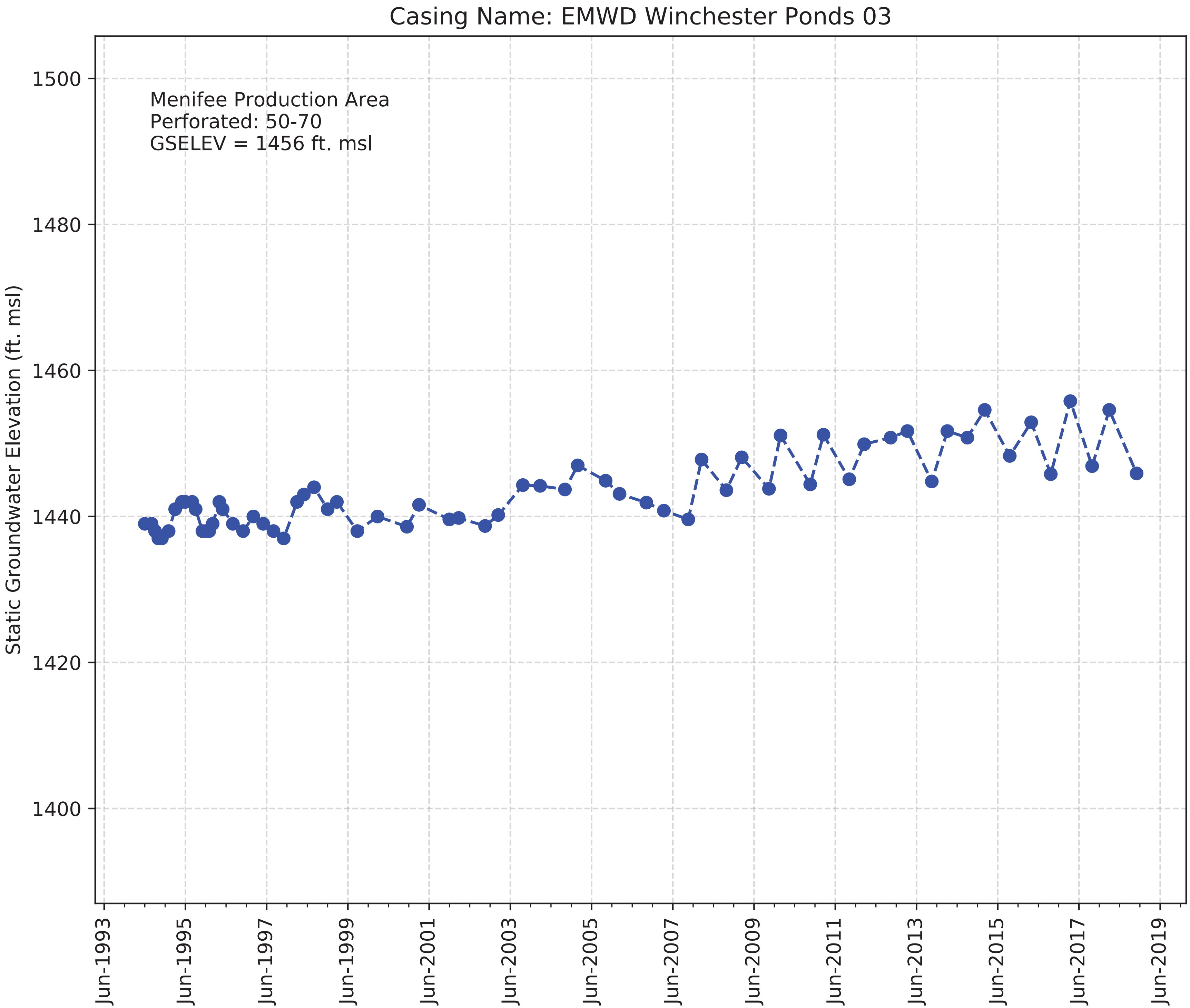

Casing Name: EMWD 87 Nuevo/Olivas
Nuevo/Lakeview Production Area
Perforated: 150-380
GSELEV = 1447 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017
Oct-2019

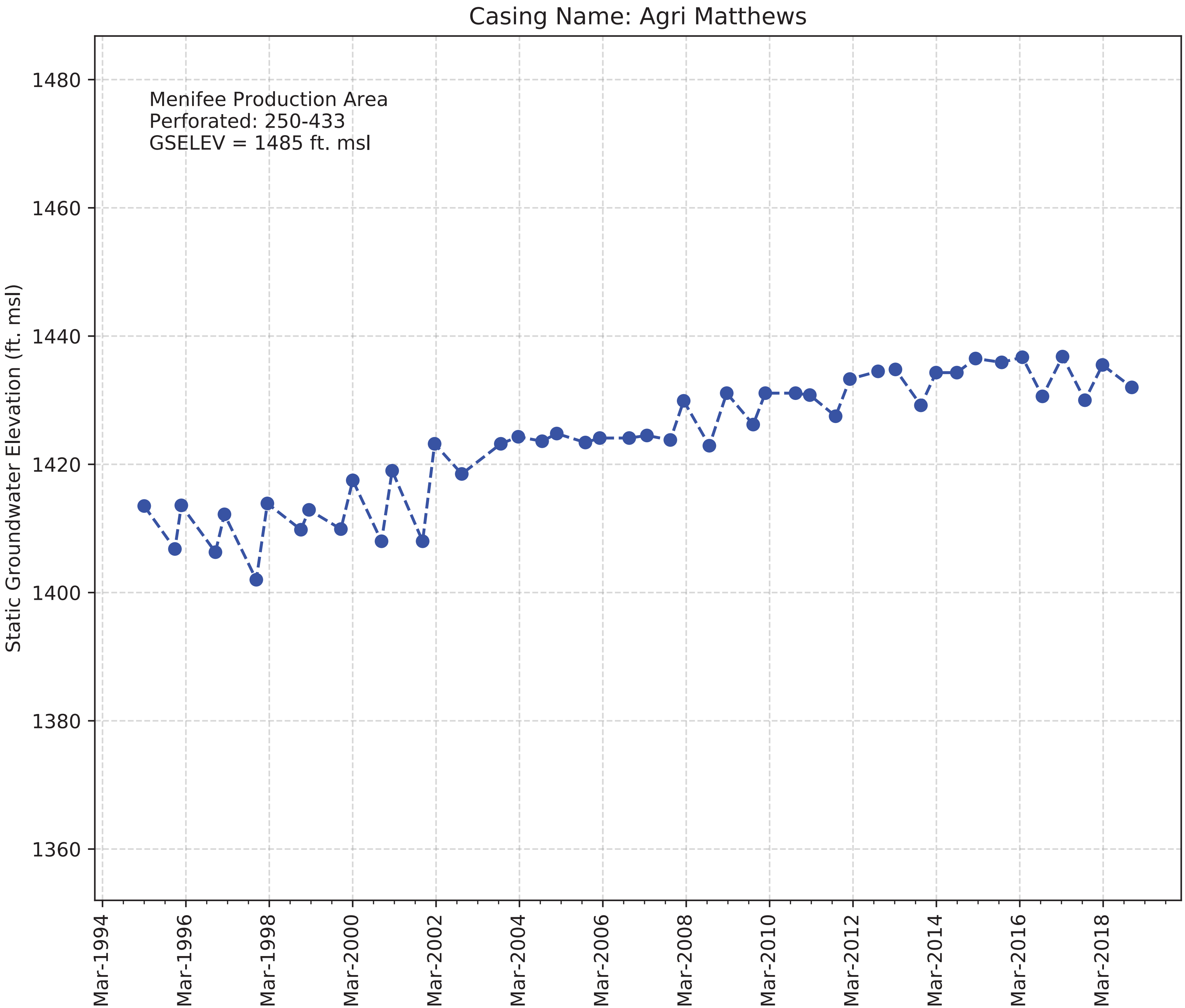

Casing Name: NWC 15
Nuevo/Lakeview Production Area
Perforated: nan
GSELEV = 1470 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1260
1240
1220
1200
Dec-2012
Dec-2014
Dec-2016
Dec-2018

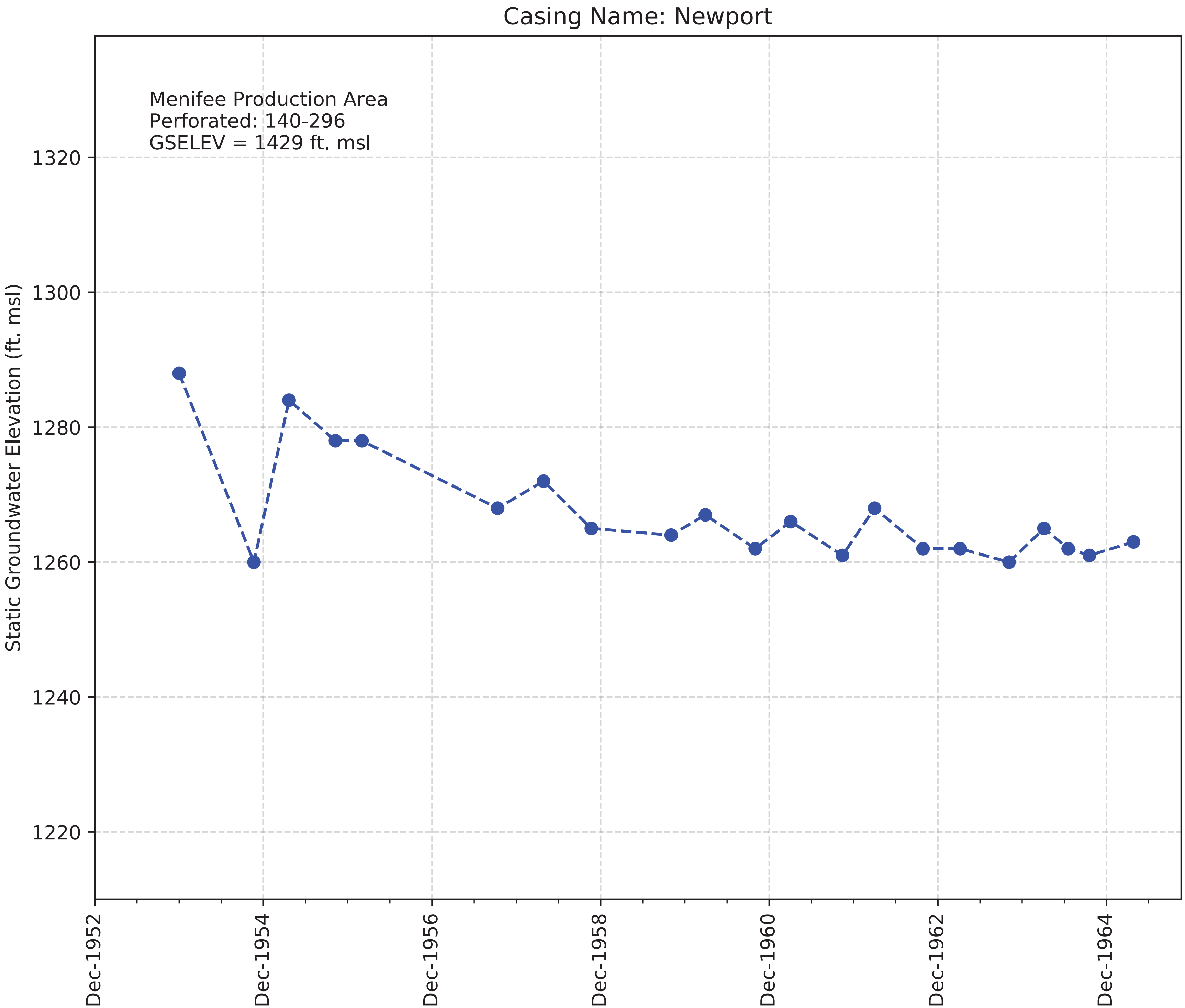

Casing Name: EMWD 93 Nuevo/Menifee
Nuevo/Lakeview Production Area
Perforated: 200-264;274-330
GSELEV = 1421 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Mar-2016
Mar-2018

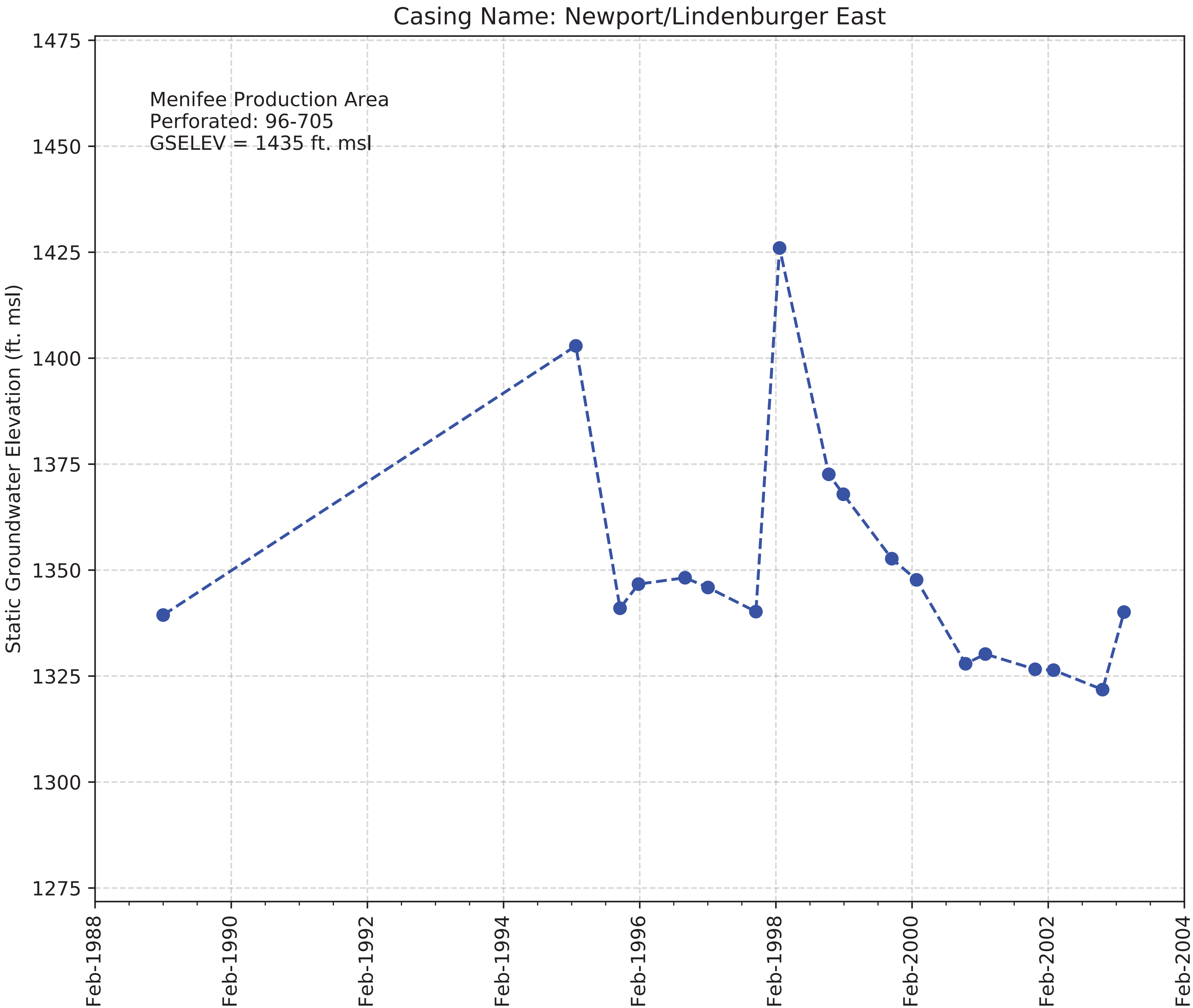

Casing Name: EMWD Winchester Ponds 05
Menifee Production Area
Perforated: 50-70
GSELEV = 1472 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

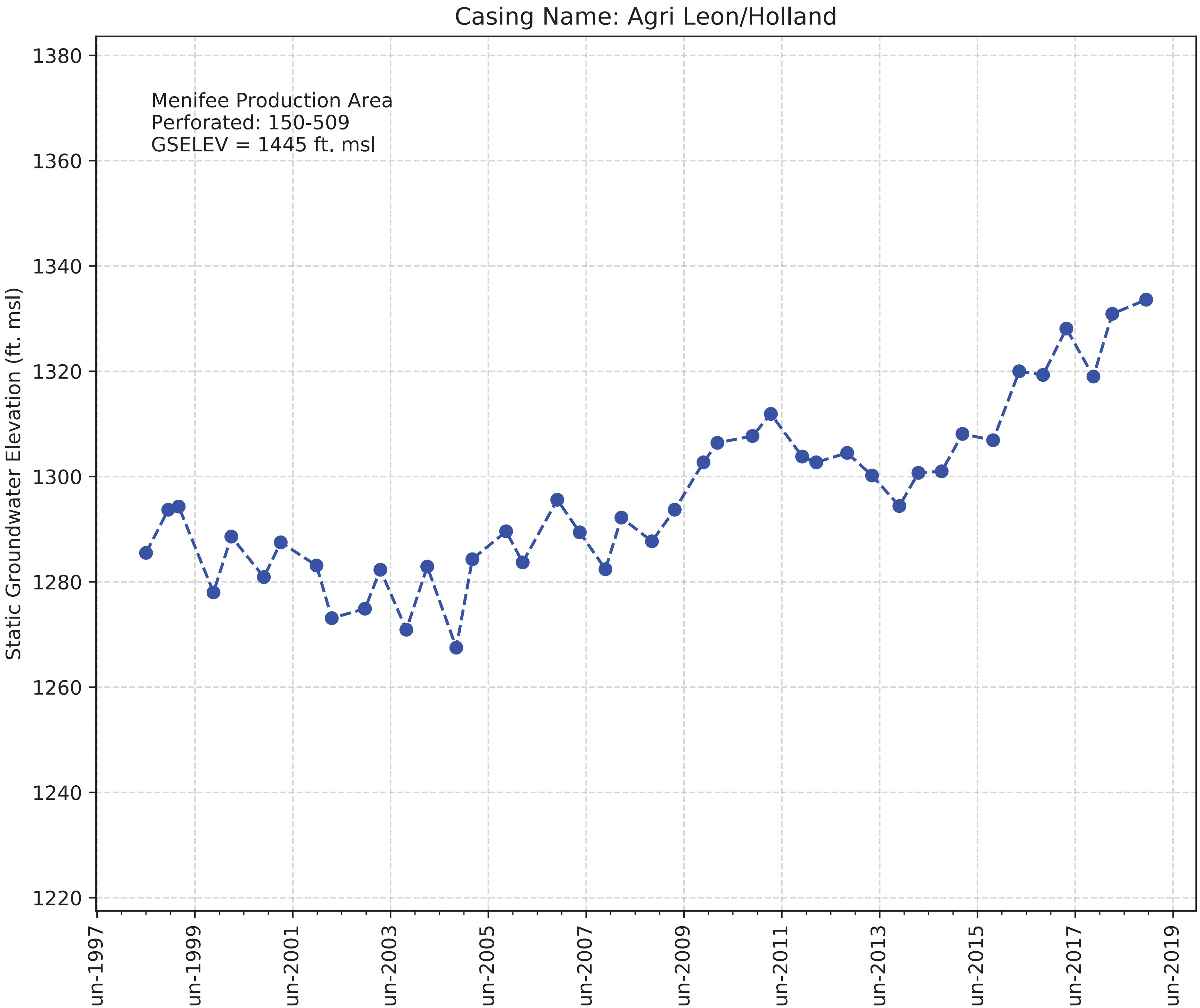

Casing Name: EMWD Winchester Ponds 04
Menifee Production Area
Perforated: 50-70
GSELEV = 1465 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

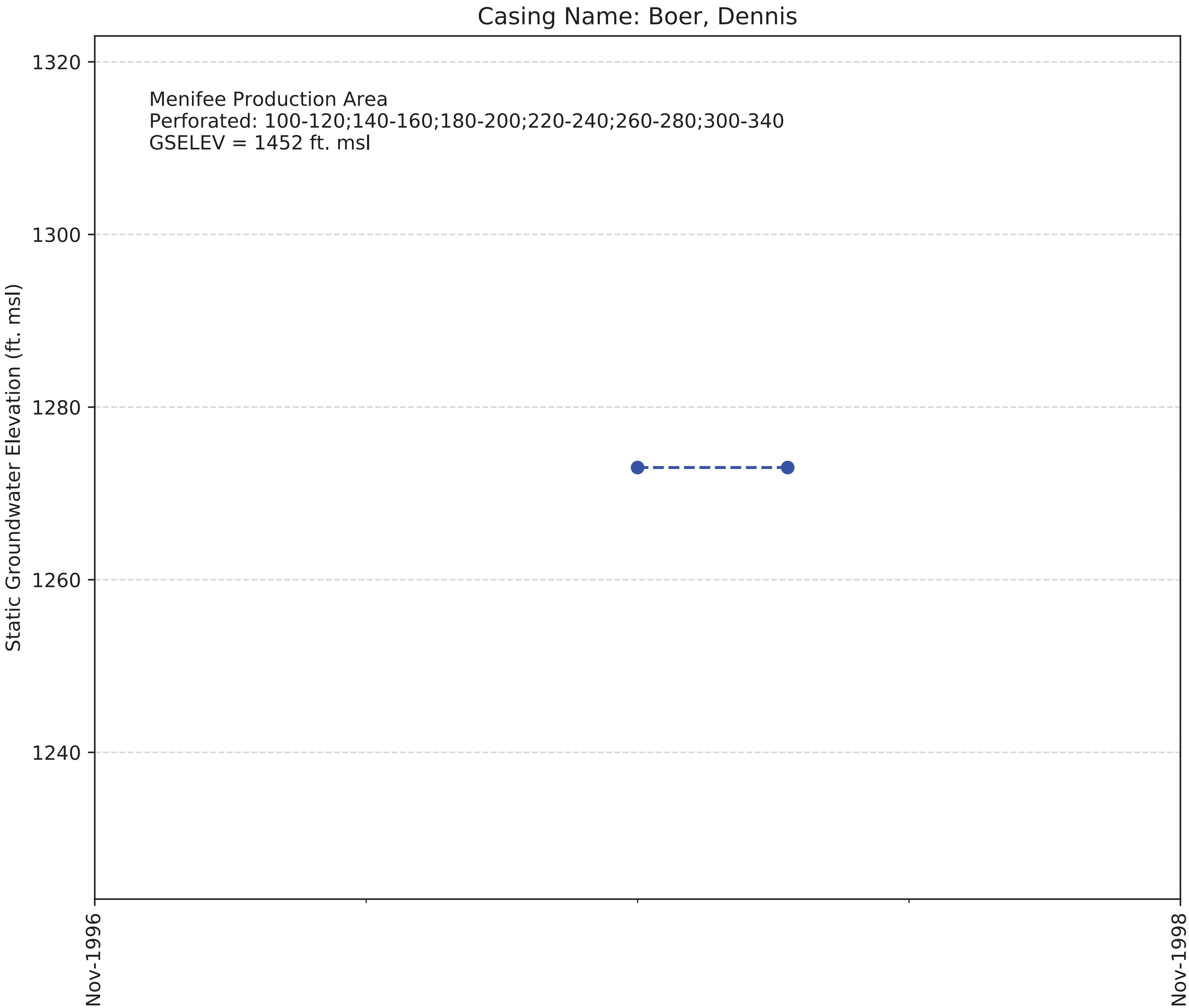

Casing Name: EMWD Winchester Ponds 03
Menifee Production Area
Perforated: 50-70
GSELEV = 1456 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1420
1440
1460
1480
1500
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

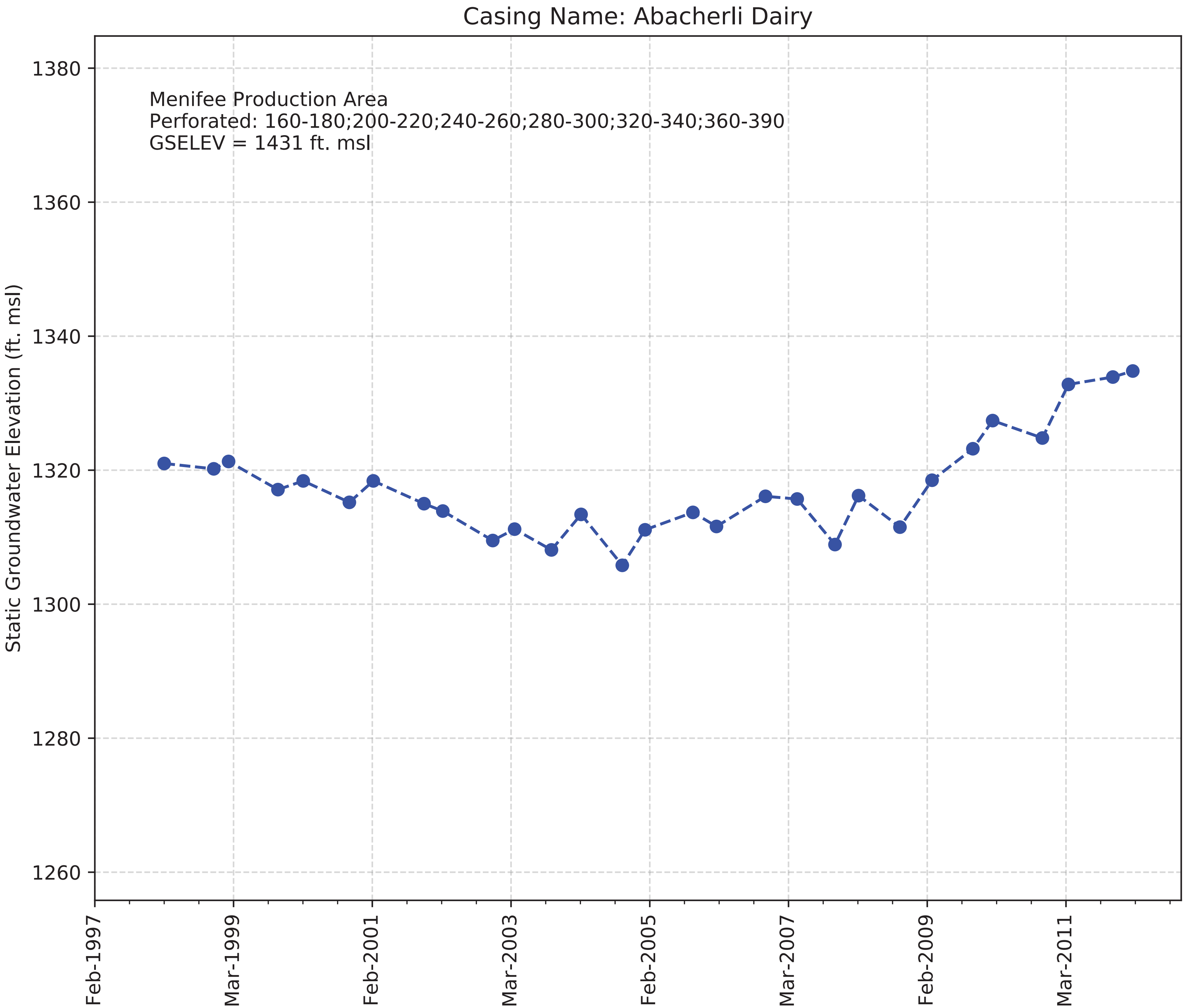

Casing Name: Agri Matthews
Menifee Production Area
Perforated: 250-433
GSELEV = 1485 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
1360
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

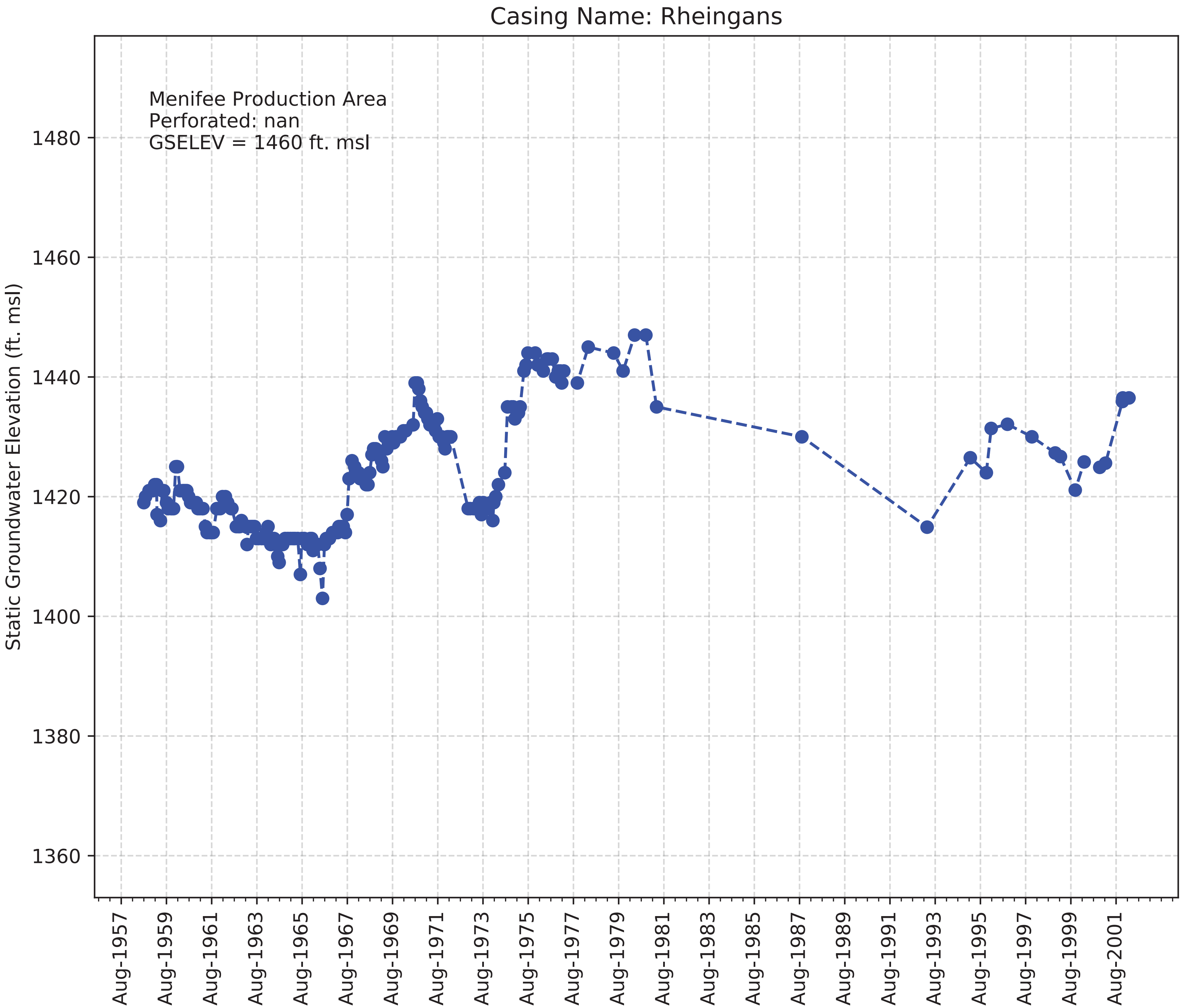

Casing Name: Newport
Menifee Production Area
Perforated: 140-296
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1320
1300
1280
1260
1240
1220
Dec-1952
Dec-1954
Dec-1956
Dec-1958
Dec-1960
Dec-1962
Dec-1964

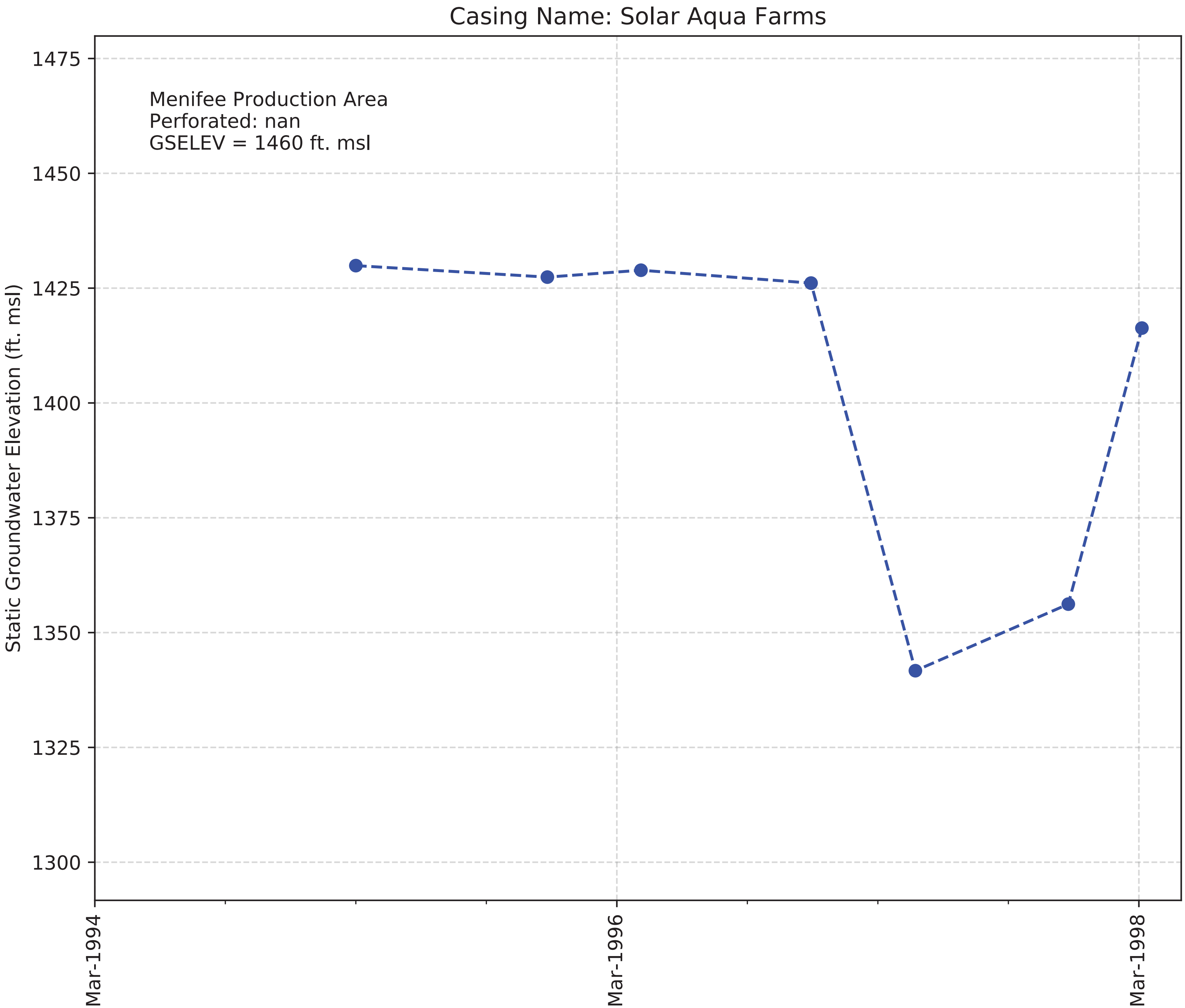

Casing Name: Newport/Lindenburger East
Menifee Production Area
Perforated: 96-705
GSELEV = 1435 ft. msl
Static Groundwater Elevation (ft. msl)
1475
1450
1425
1400
1375
1350
1325
1300
1275
Feb-1988
Feb-1990
Feb-1992
Feb-1994
Feb-1996
Feb-1998
Feb-2000
Feb-2002
Feb-2004

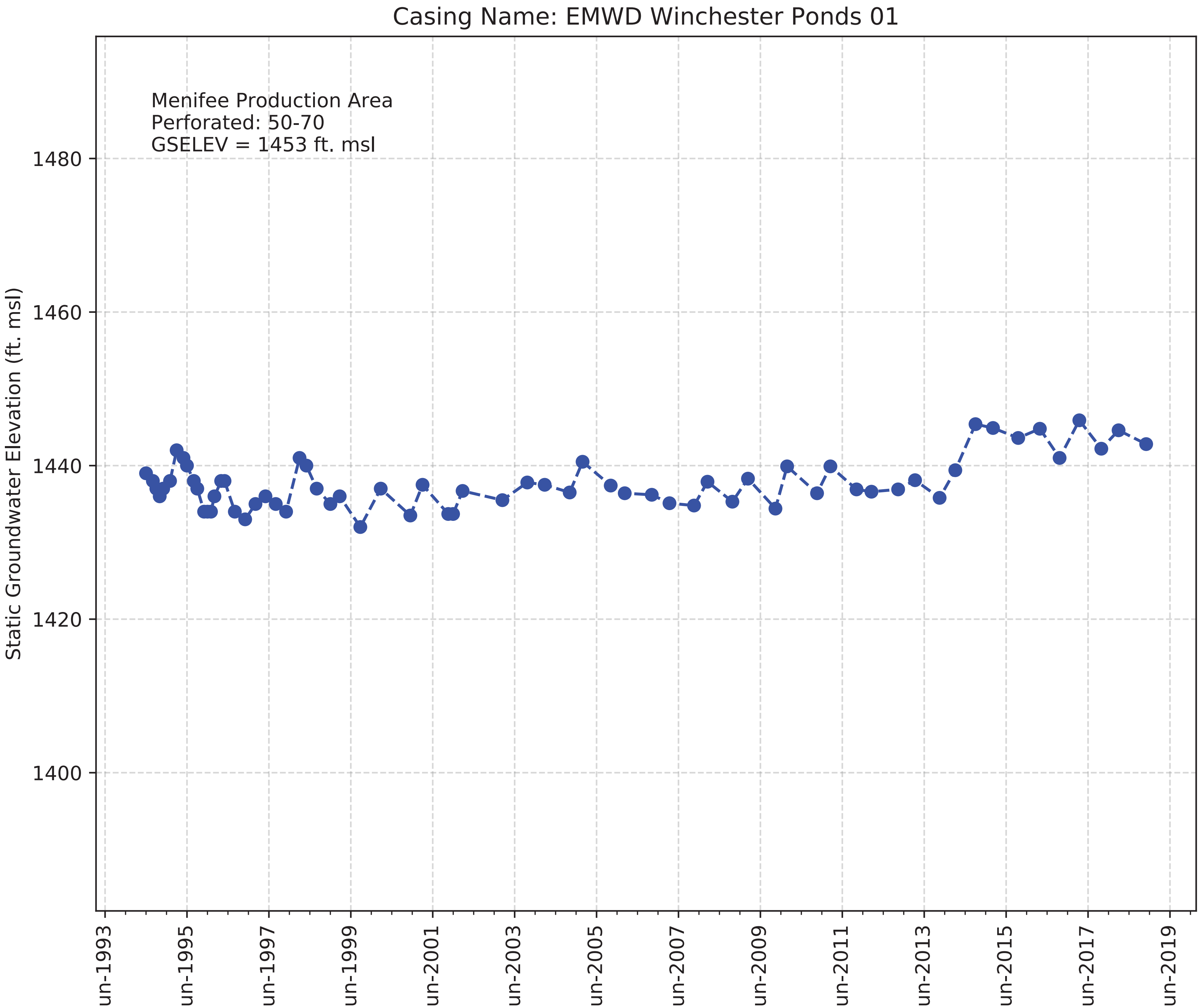

Casing Name: Agri Leon/Holland
Menifee Production Area
Perforated: 150-509
GSELEV = 1445 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
1260
1240
1220
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

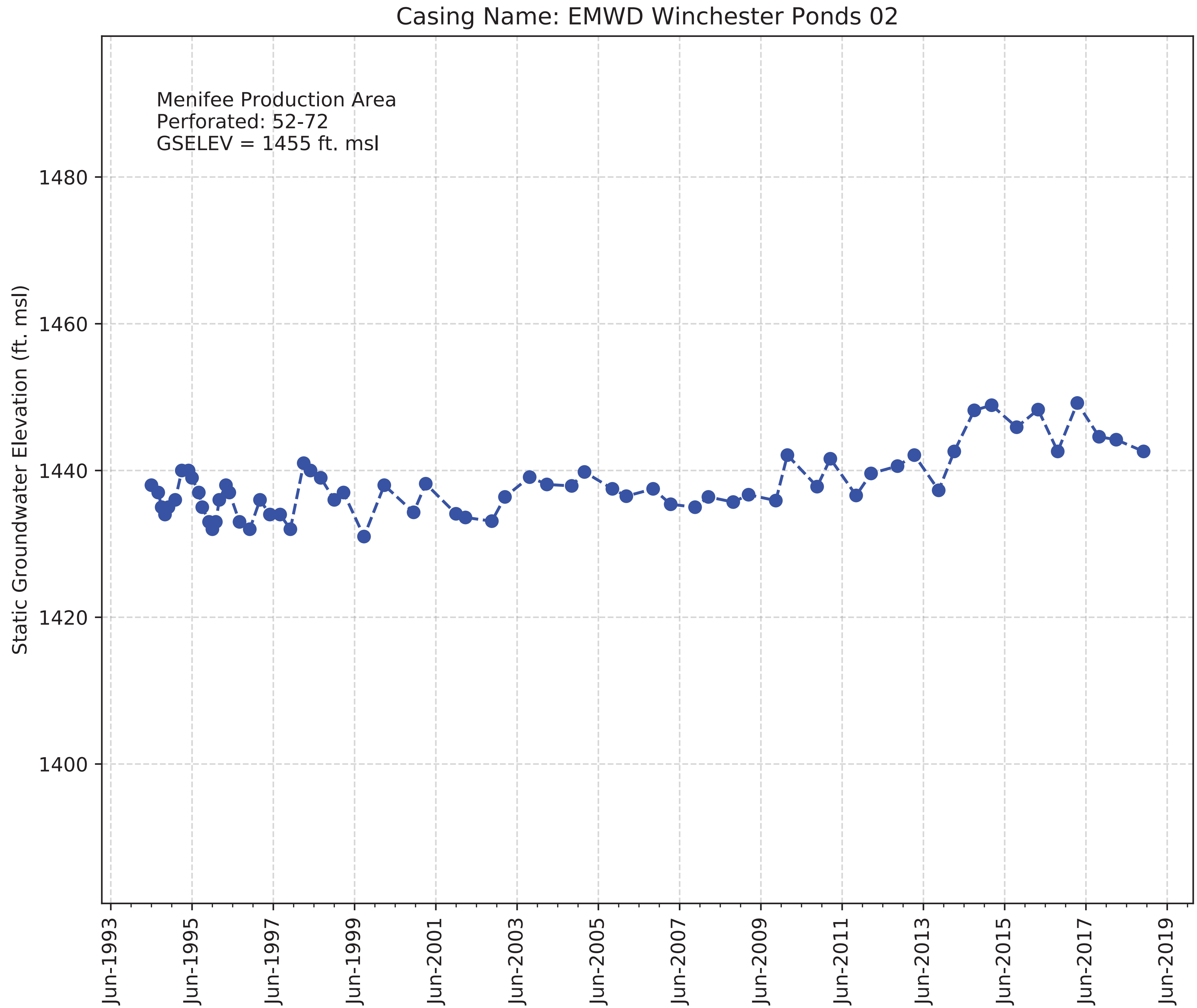

Casing Name: Boer, Dennis
Menifee Production Area
Perforated: 100-120;140-160;180-200;220-240;260-280;300-340
GSELEV = 1452 ft. msl
Static Groundwater Elevation (ft. msl)
1320
1300
1280
1260
1240
Nov-1996
Nov-1998

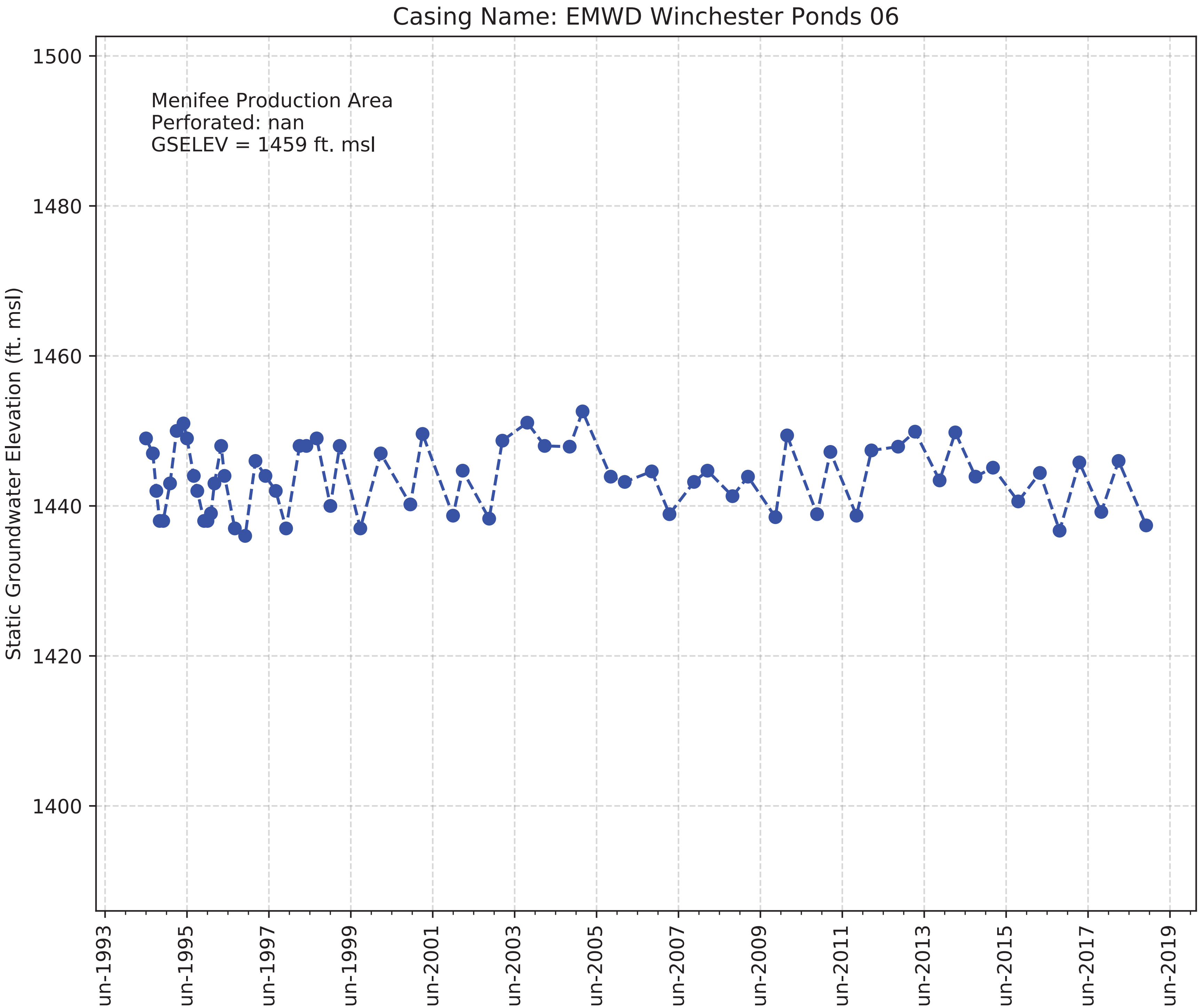

Casing Name: Abacherli Dairy
Menifee Production Area
Perforated: 160-180;200-220;240-260;280-300;320-340;360-390
GSELEV = 1431 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
1260
Feb-1997
Mar-1999
Feb-2001
Mar-2003
Feb-2005
Mar-2007
Feb-2009
Mar-2011

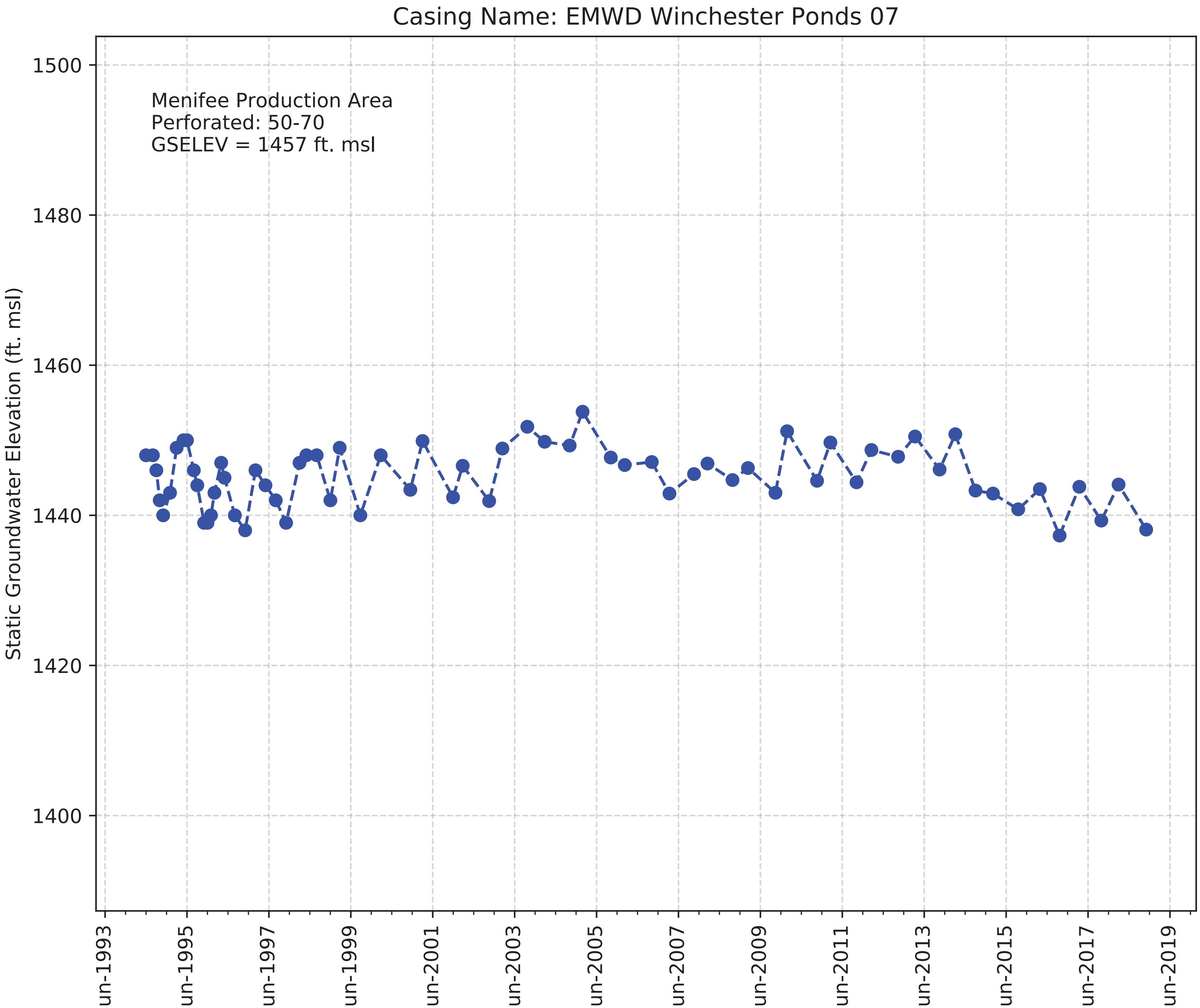

Casing Name: Rheingans
Menifee Production Area
Perforated: nan
GSELEV = 1460 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
1360
Aug-1957
Aug-1959
Aug-1961
Aug-1963
Aug-1965
Aug-1967
Aug-1969
Aug-1971
Aug-1973
Aug-1975
Aug-1977
Aug-1979
Aug-1981
Aug-1983
Aug-1985
Aug-1987
Aug-1989
Aug-1991
Aug-1993
Aug-1995
Aug-1997
Aug-1999
Aug-2001

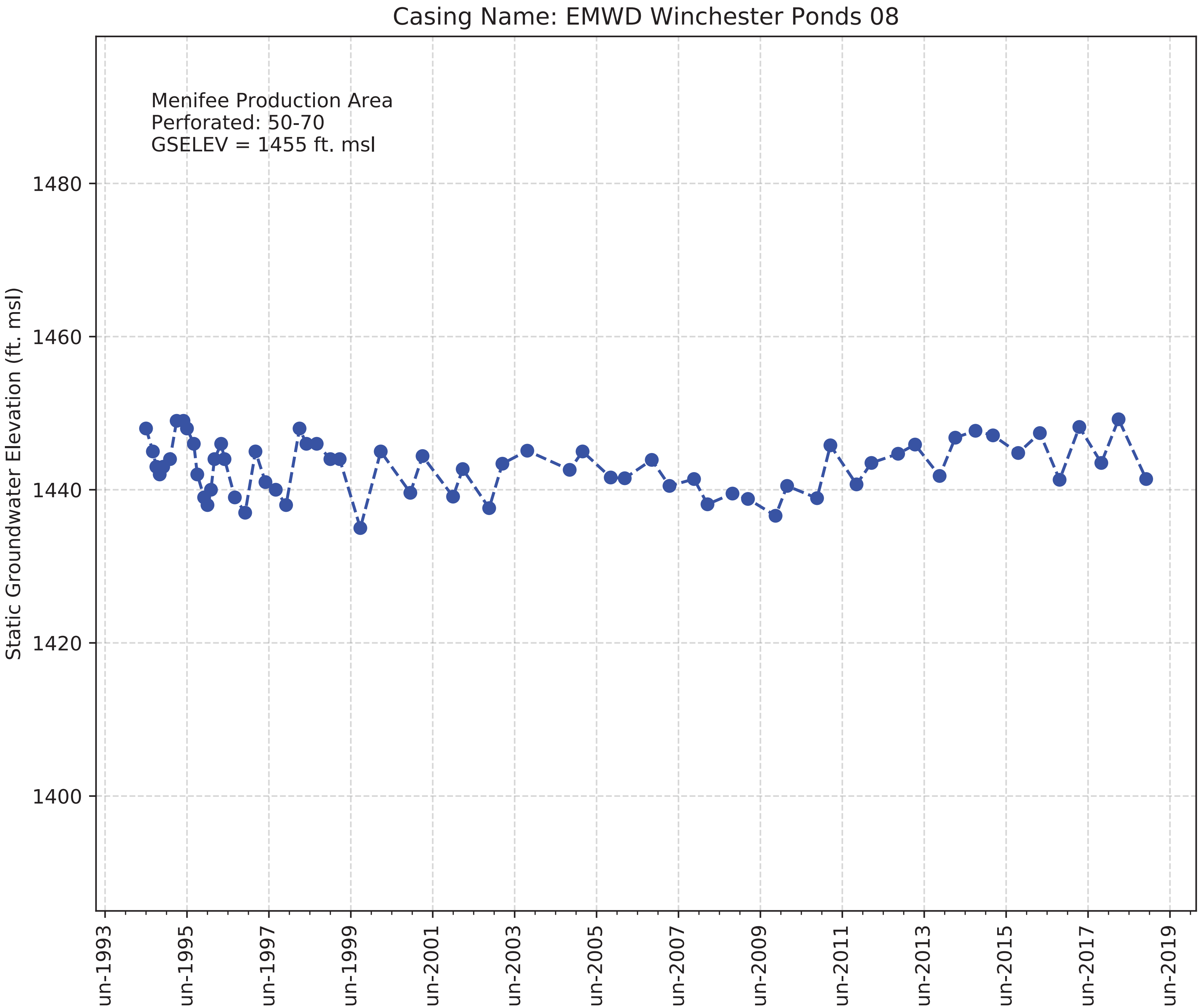

Casing Name: Solar Aqua Farms
Menifee Production Area
Perforated: nan
GSELEV = 1460 ft. msl
Static Groundwater Elevation (ft. msl)
1475
1450
1425
1400
1375
1350
1325
1300
Mar-1994
Mar-1996
Mar-1998

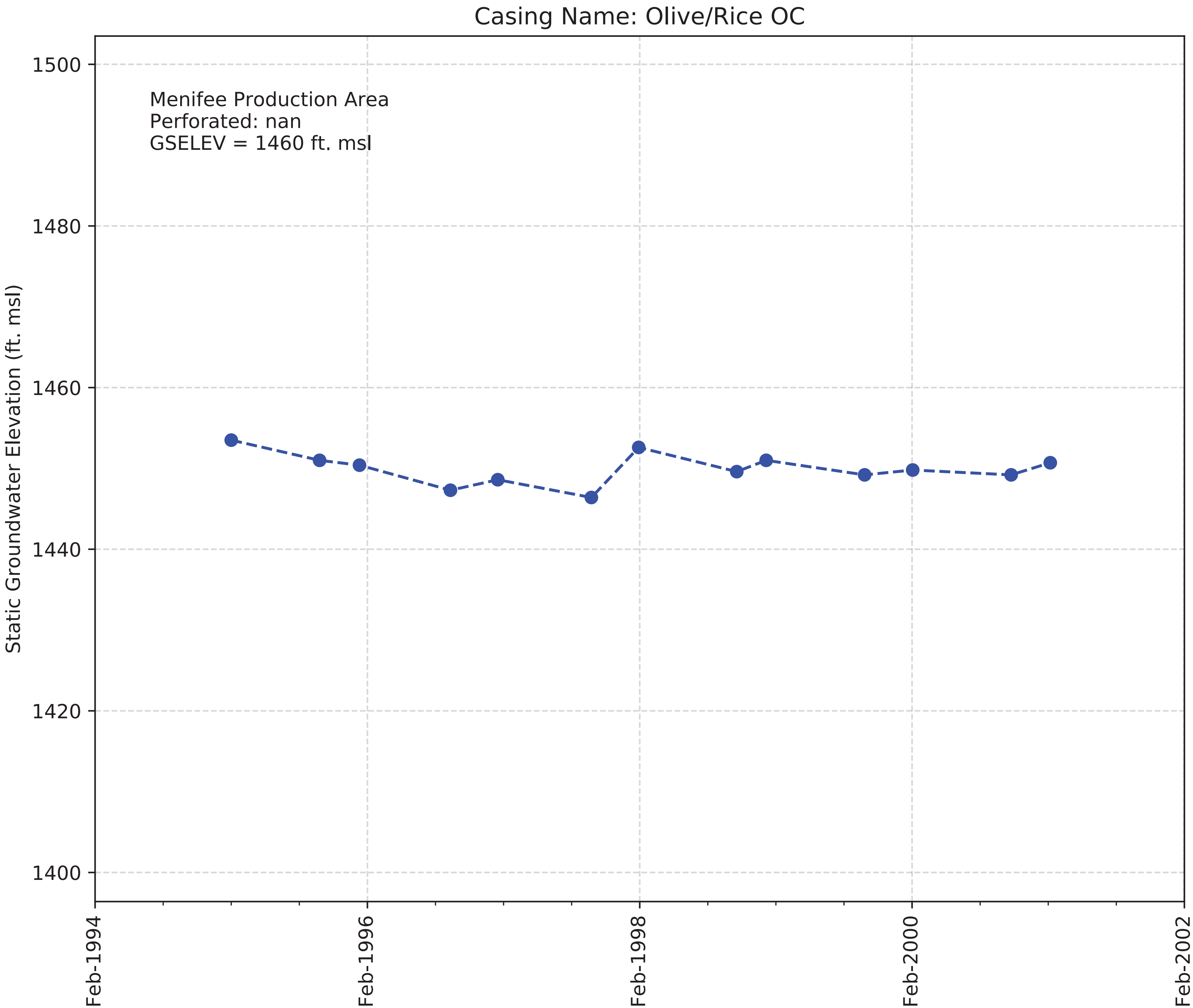

Casing Name: EMWD Winchester Ponds 01
Menifee Production Area
Perforated: 50-70
GSELEV = 1453 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1420
1440
1460
1480
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

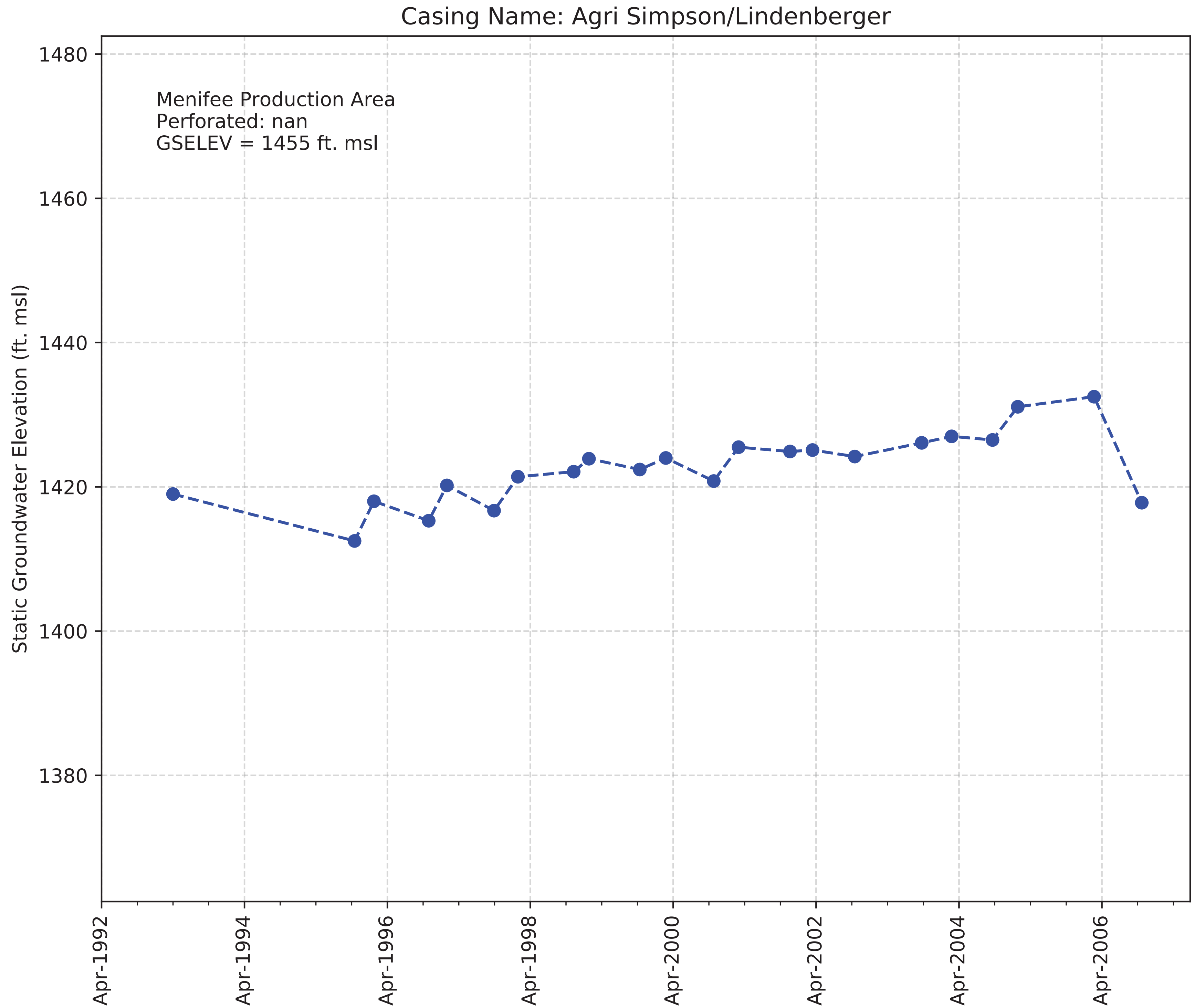

Casing Name: EMWD Winchester Ponds 02
Menifee Production Area
Perforated: 52-72
GSELEV = 1455 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

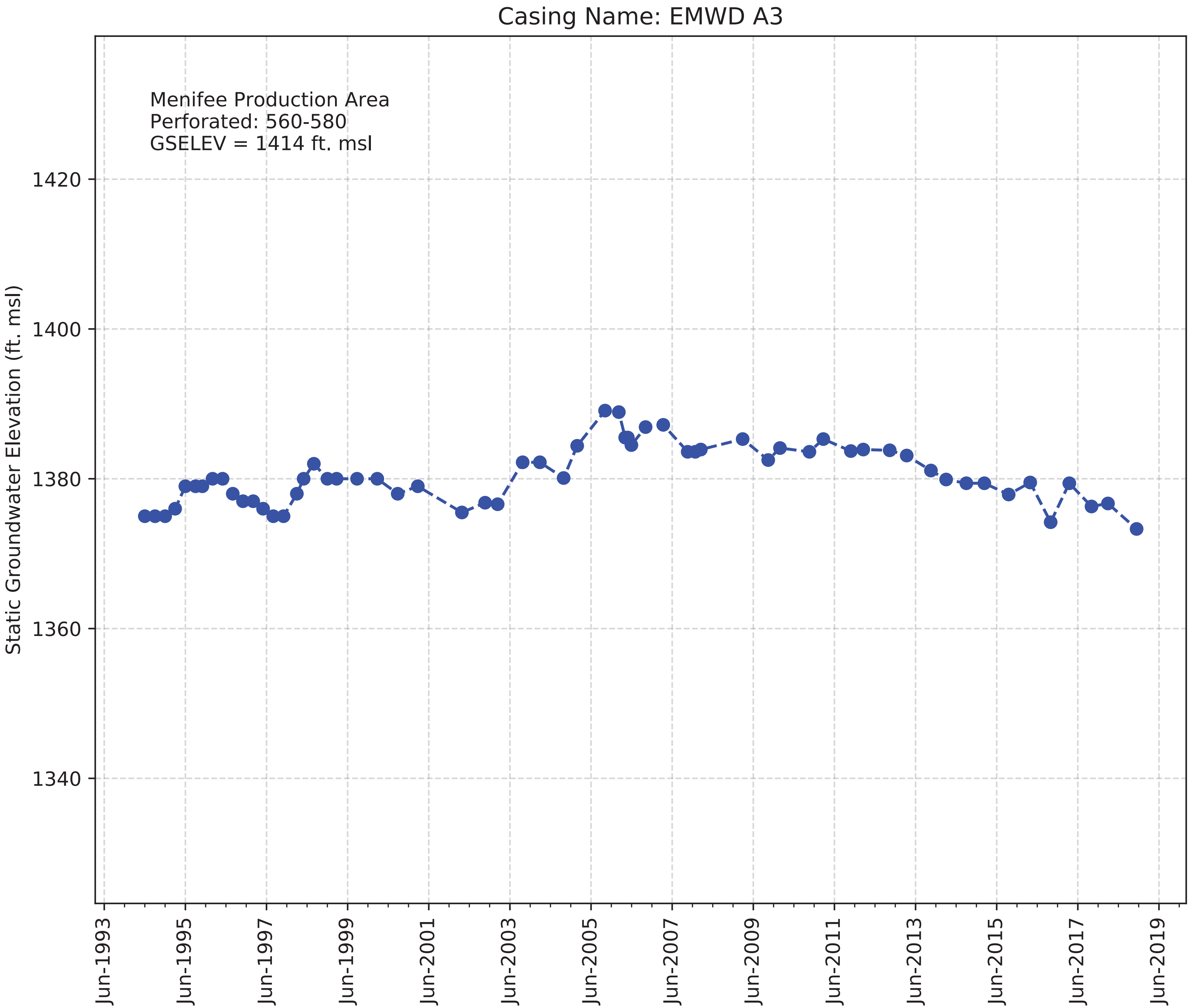

Casing Name: EMWD Winchester Ponds 06
Menifee Production Area
Perforated: nan
GSELEV = 1459 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

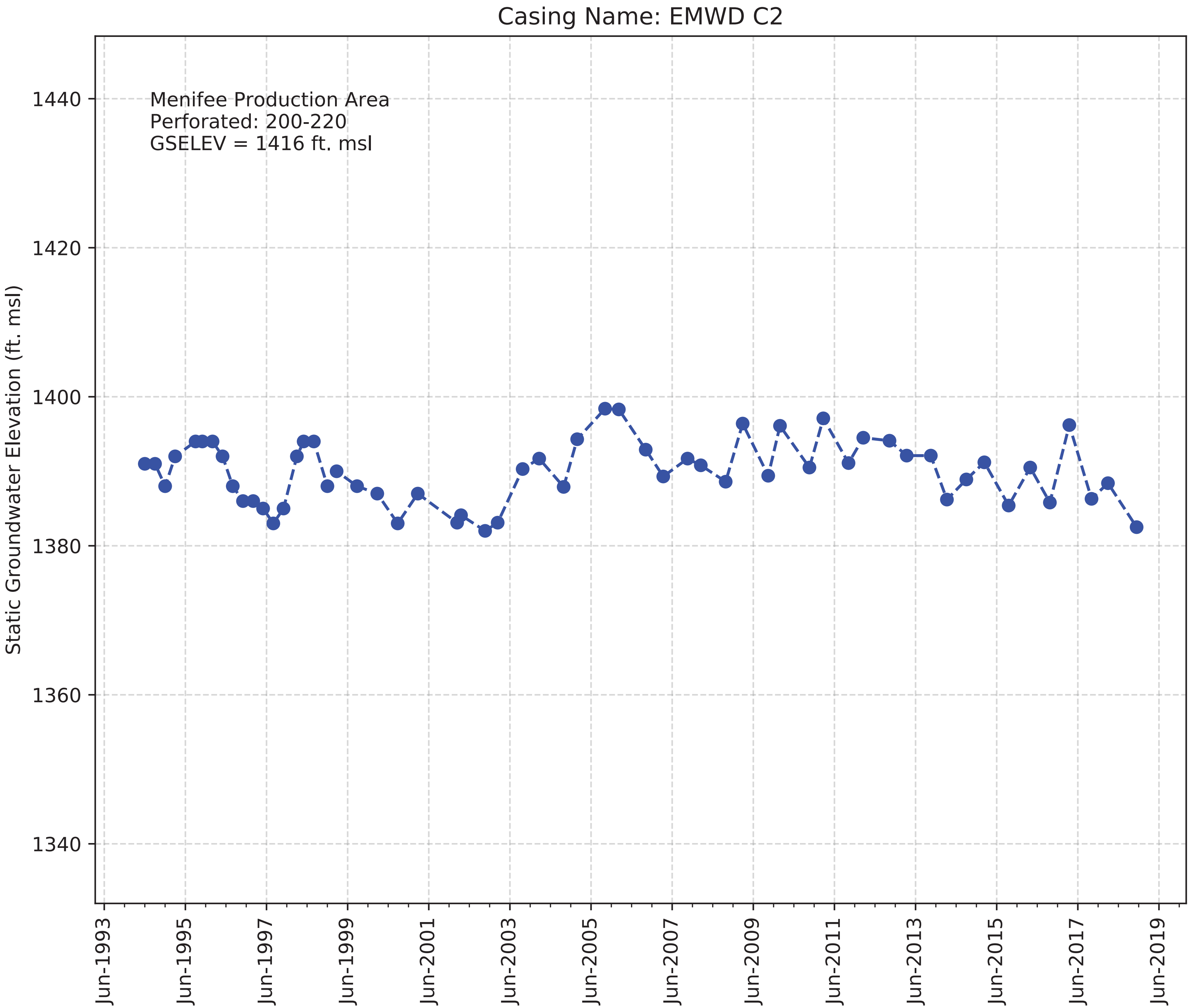

Casing Name: EMWD Winchester Ponds 07
Menifee Production Area
Perforated: 50-70
GSELEV = 1457 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

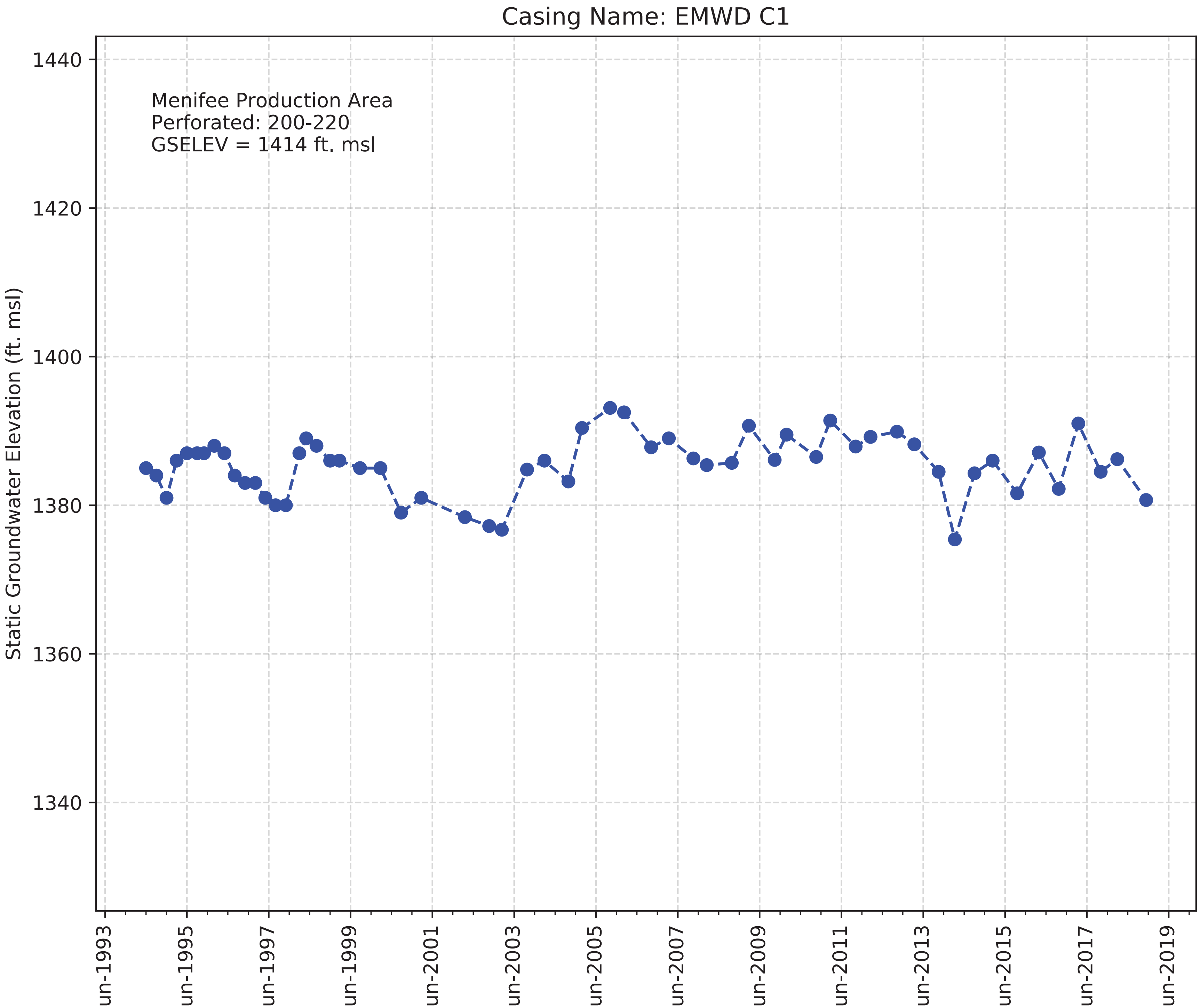

Casing Name: EMWD Winchester Ponds 08
Menifee Production Area
Perforated: 50-70
GSELEV = 1455 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

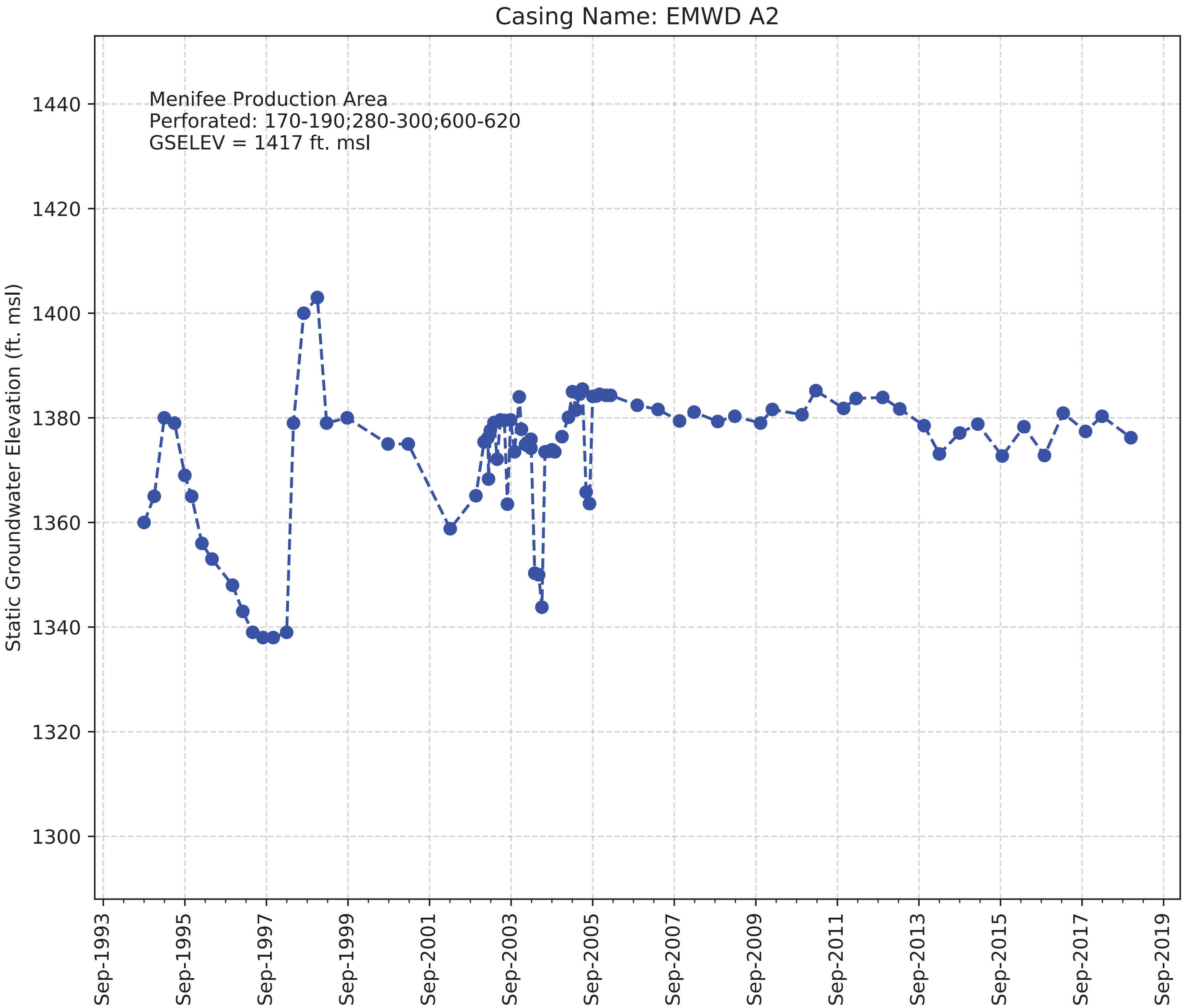

Casing Name: Olive/Rice OC
Menifee Production Area
Perforated: nan
GSELEV = 1460 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
1400
Feb-1994
Feb-1996
Feb-1998
Feb-2000
Feb-2002

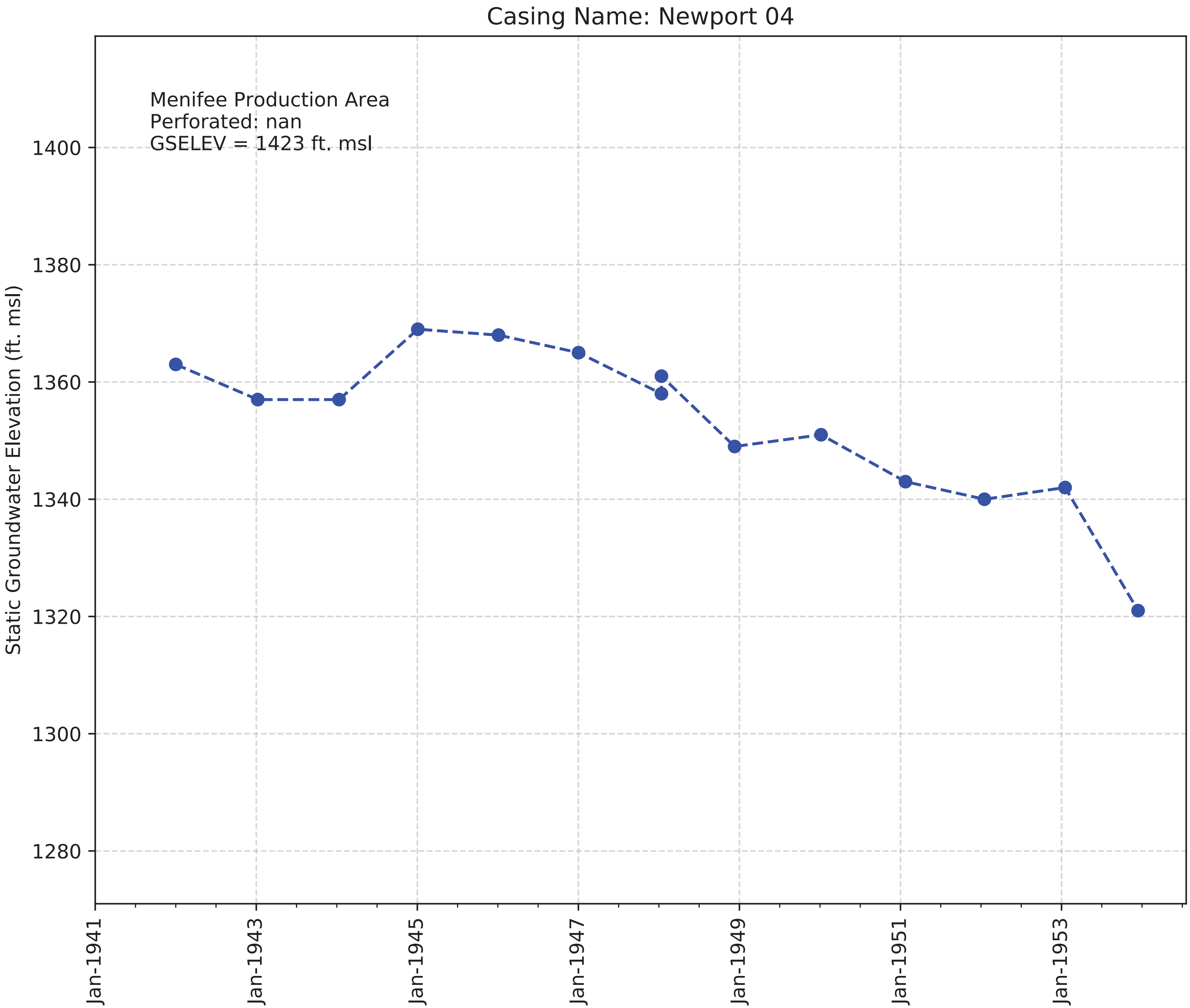

Casing Name: Agri Simpson/Lindenberger
Menifee Production Area
Perforated: nan
GSELEV = 1455 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
Apr-1992
Apr-1994
Apr-1996
Apr-1998
Apr-2000
Apr-2002
Apr-2004
Apr-2006

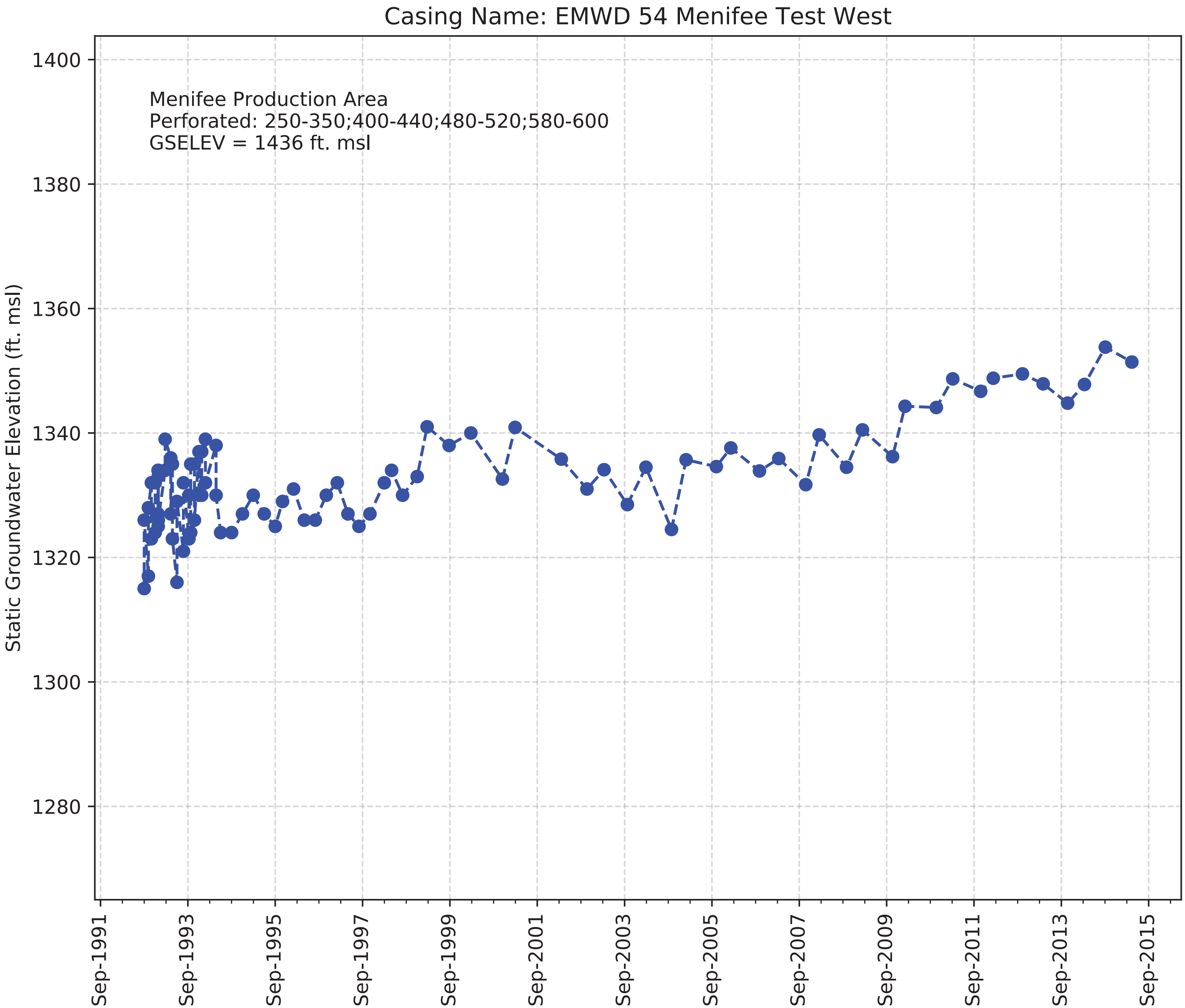

Casing Name: EMWD A3
Menifee Production Area
Perforated: 560-580
GSELEV = 1414 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

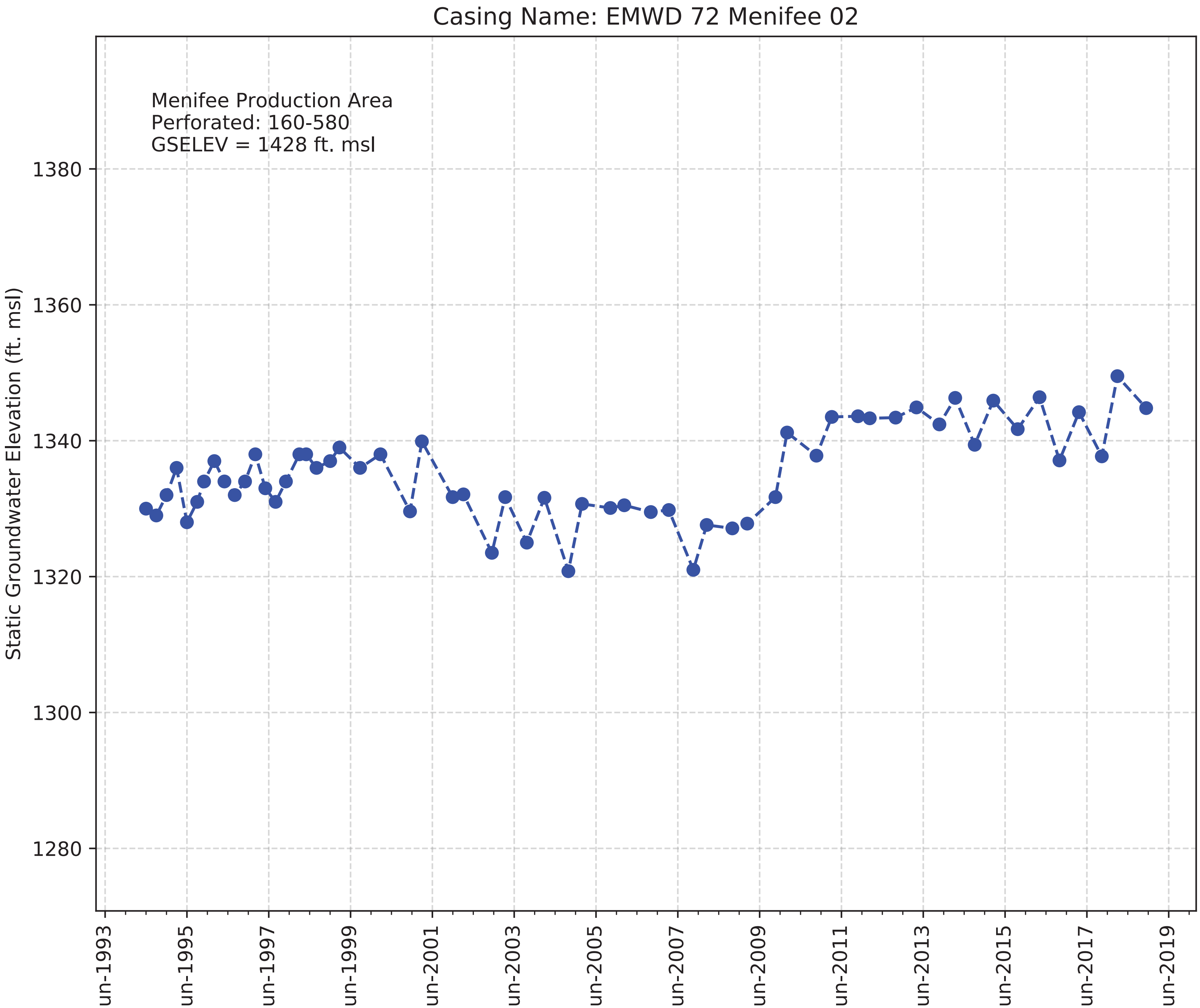

Casing Name: EMWD C2
Menifee Production Area
Perforated: 200-220
GSELEV = 1416 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

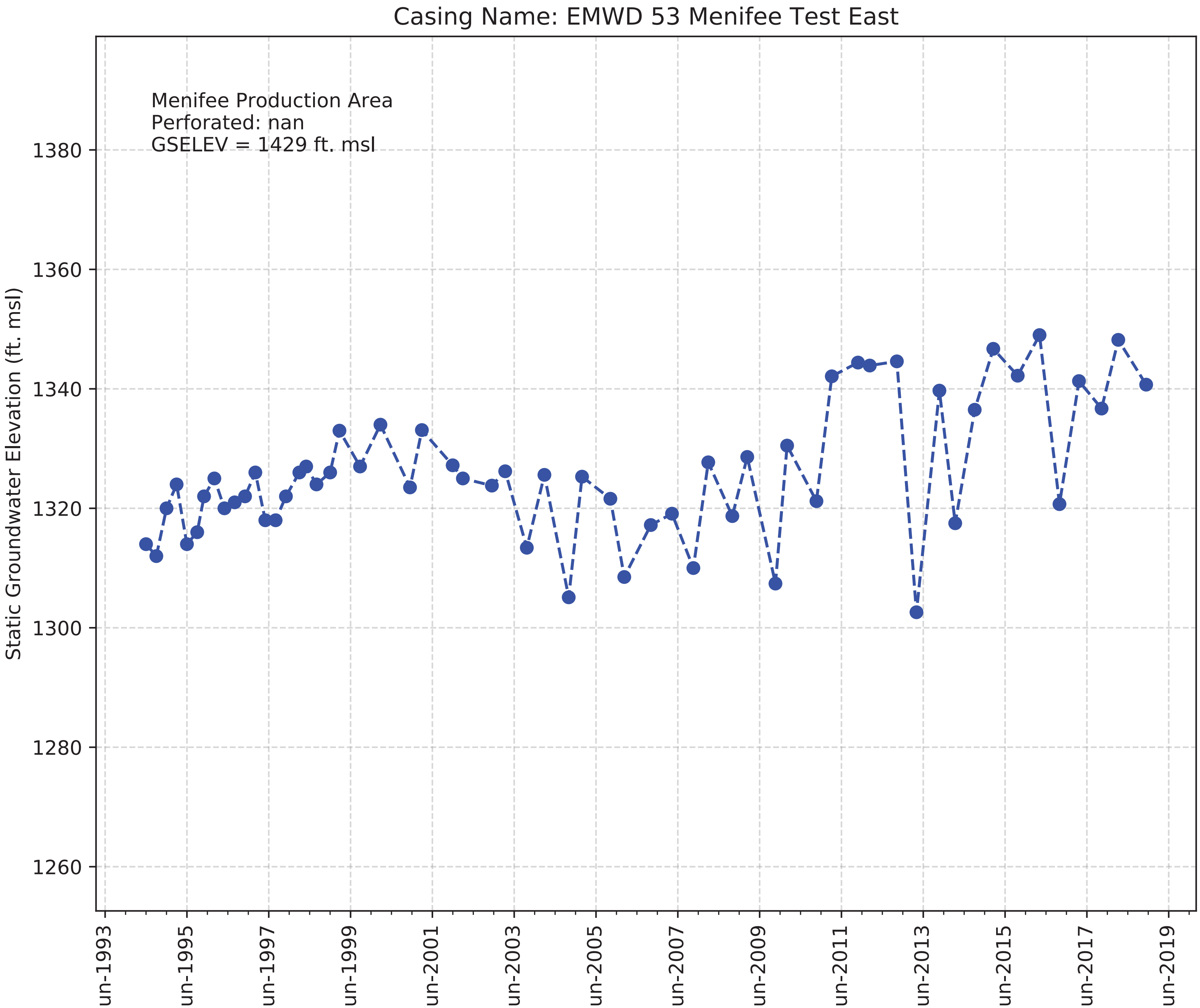

Casing Name: EMWD C1
Menifee Production Area
Perforated: 200-220
GSELEV = 1414 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

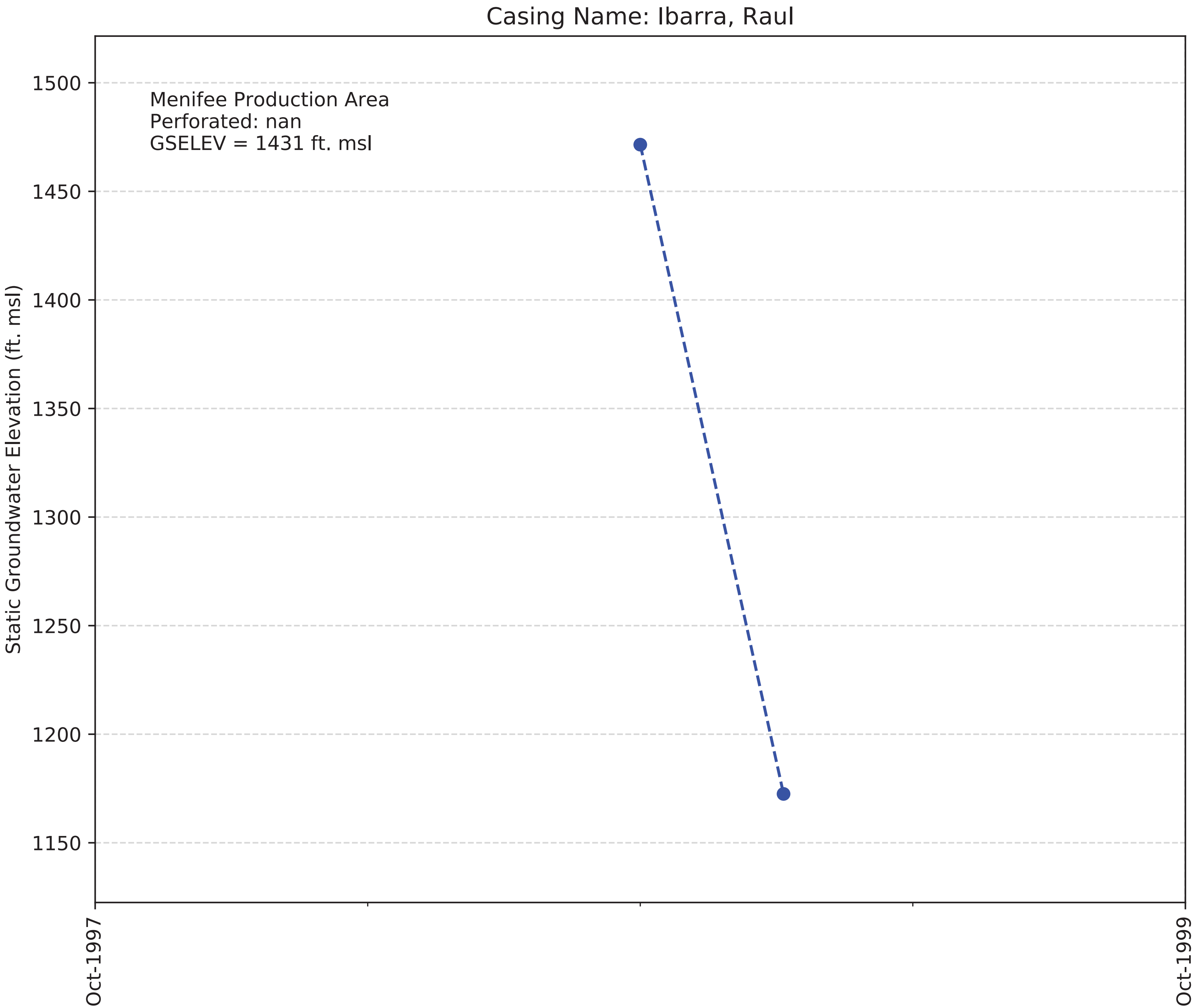

Casing Name: EMWD A2
Menifee Production Area
Perforated: 170-190;280-300;600-620
GSELEV = 1417 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1320
1340
1360
1380
1400
1420
1440
Sep-1993
Sep-1995
Sep-1997
Sep-1999
Sep-2001
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015
Sep-2017
Sep-2019

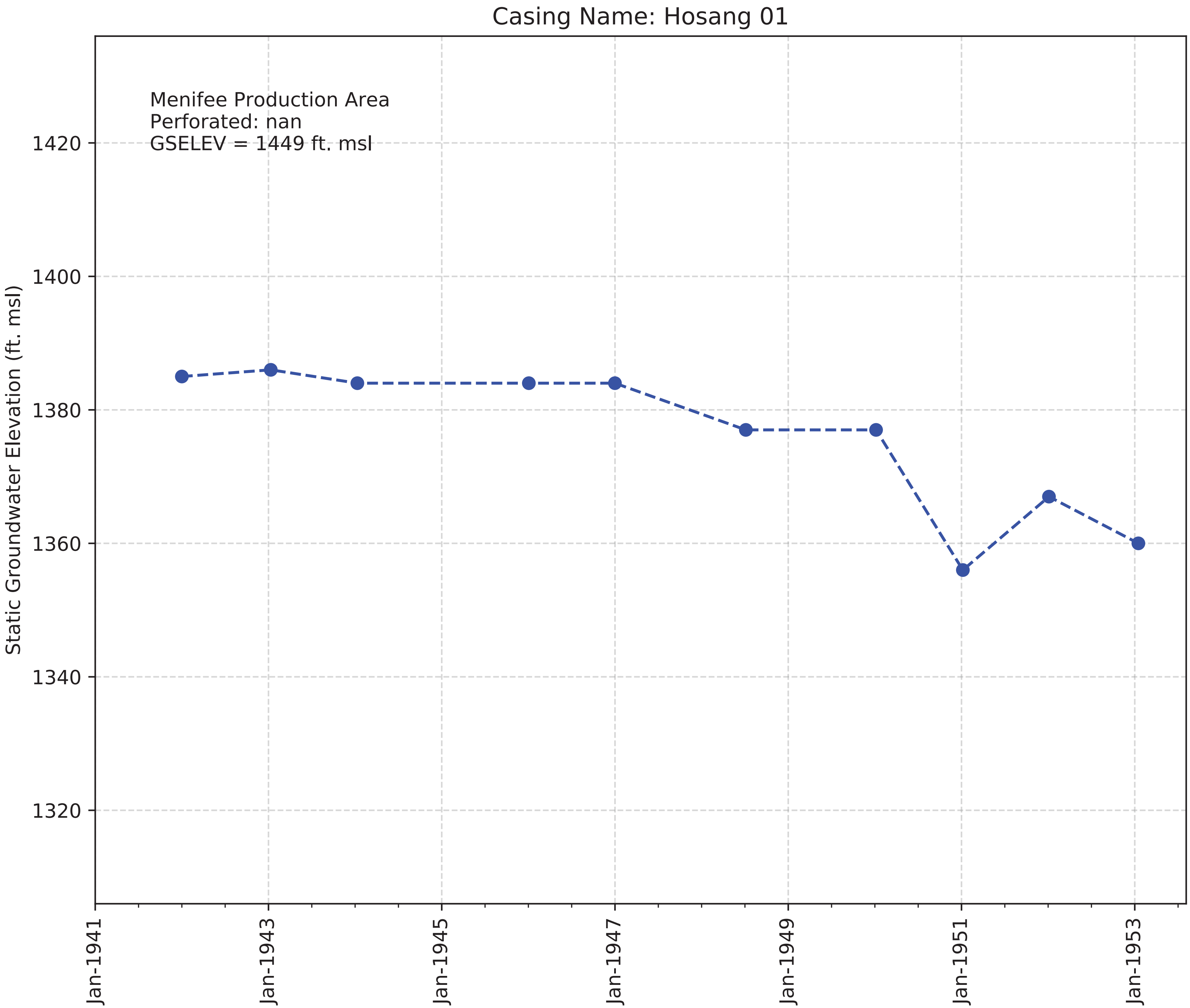

Casing Name: Newport 04
Menifee Production Area
Perforated: nan
GSELEV = 1423 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
Jan-1941
Jan-1943
Jan-1945
Jan-1947
Jan-1949
Jan-1951
Jan-1953

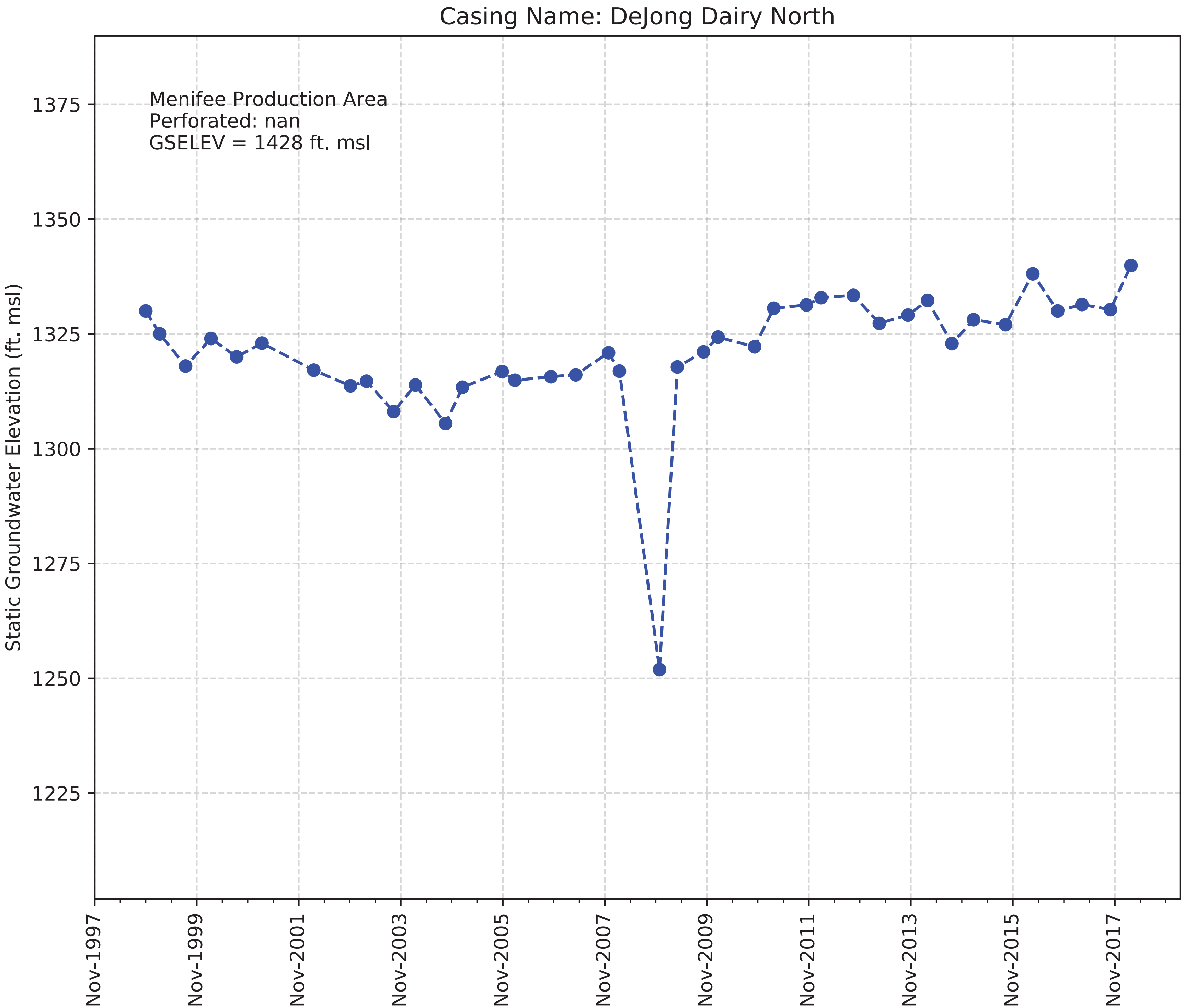

Casing Name: EMWD 54 Menifee Test West
Menifee Production Area
Perforated: 250-350;400-440;480-520;580-600
GSELEV = 1436 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
Sep-1991
Sep-1993
Sep-1995
Sep-1997
Sep-1999
Sep-2001
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015

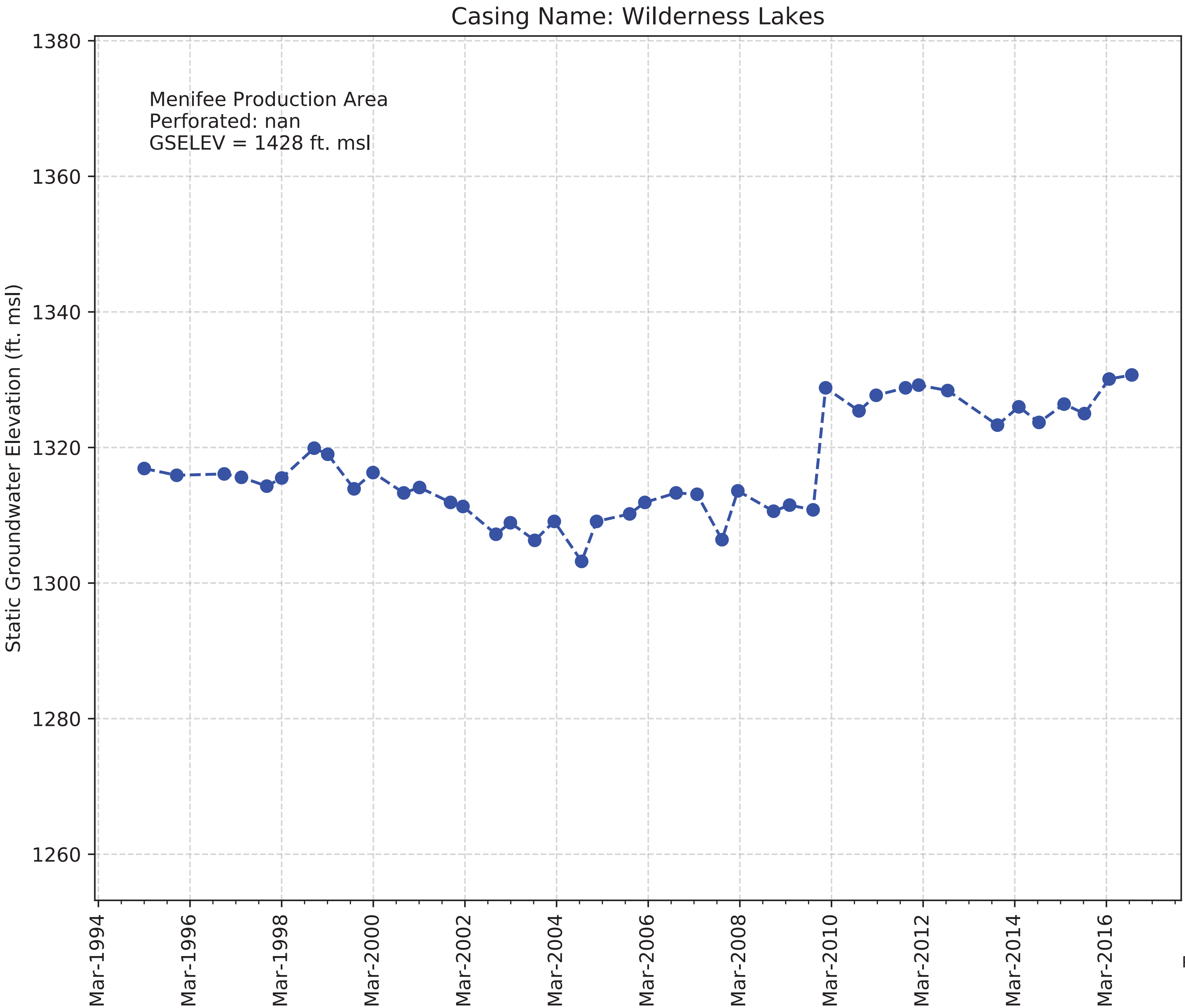

Casing Name: EMWD 72 Menifee 02
Menifee Production Area
Perforated: 160-580
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1300
1320
1340
1360
1380
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

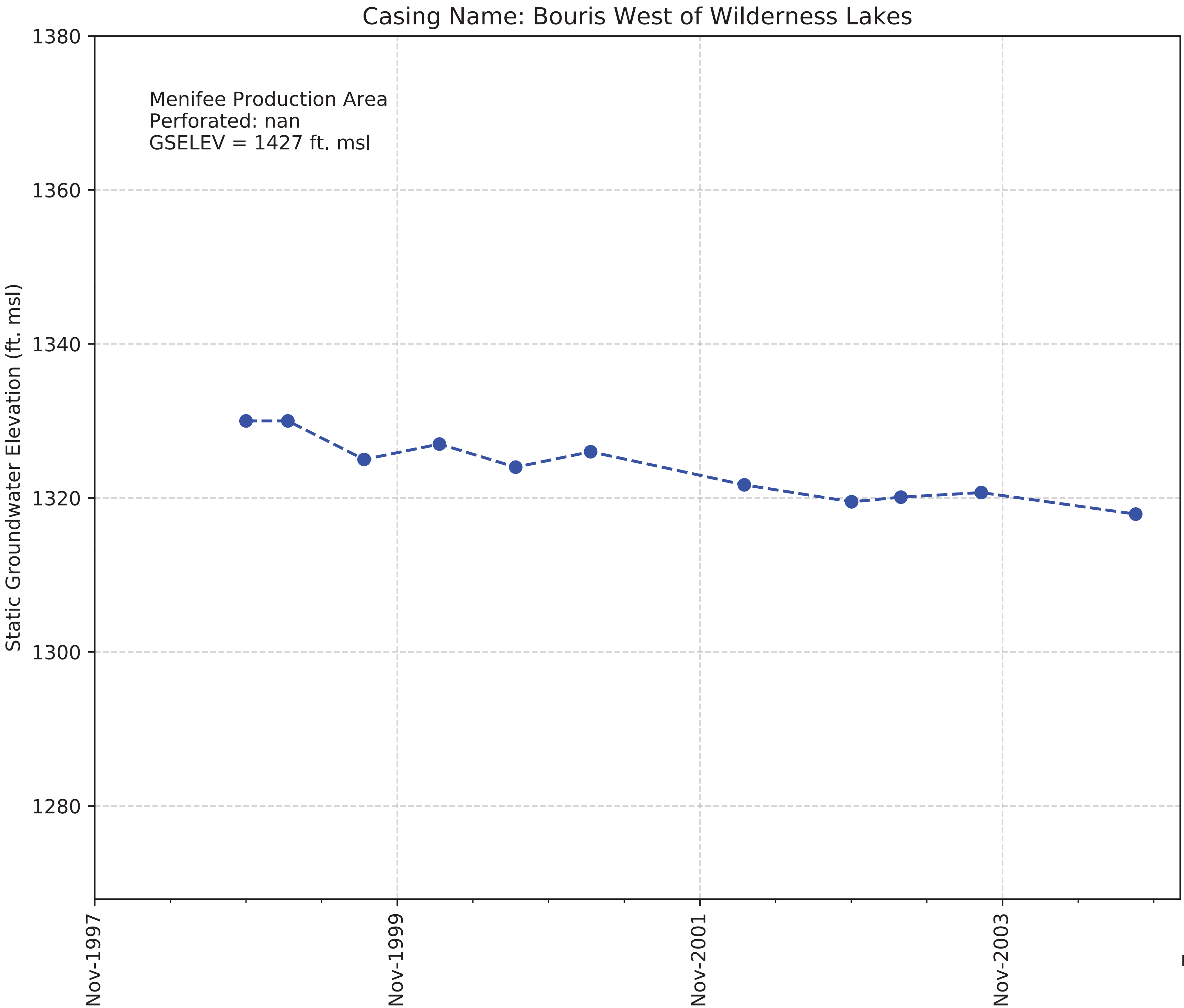

Casing Name: EMWD 53 Menifee Test East
Menifee Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
1260
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

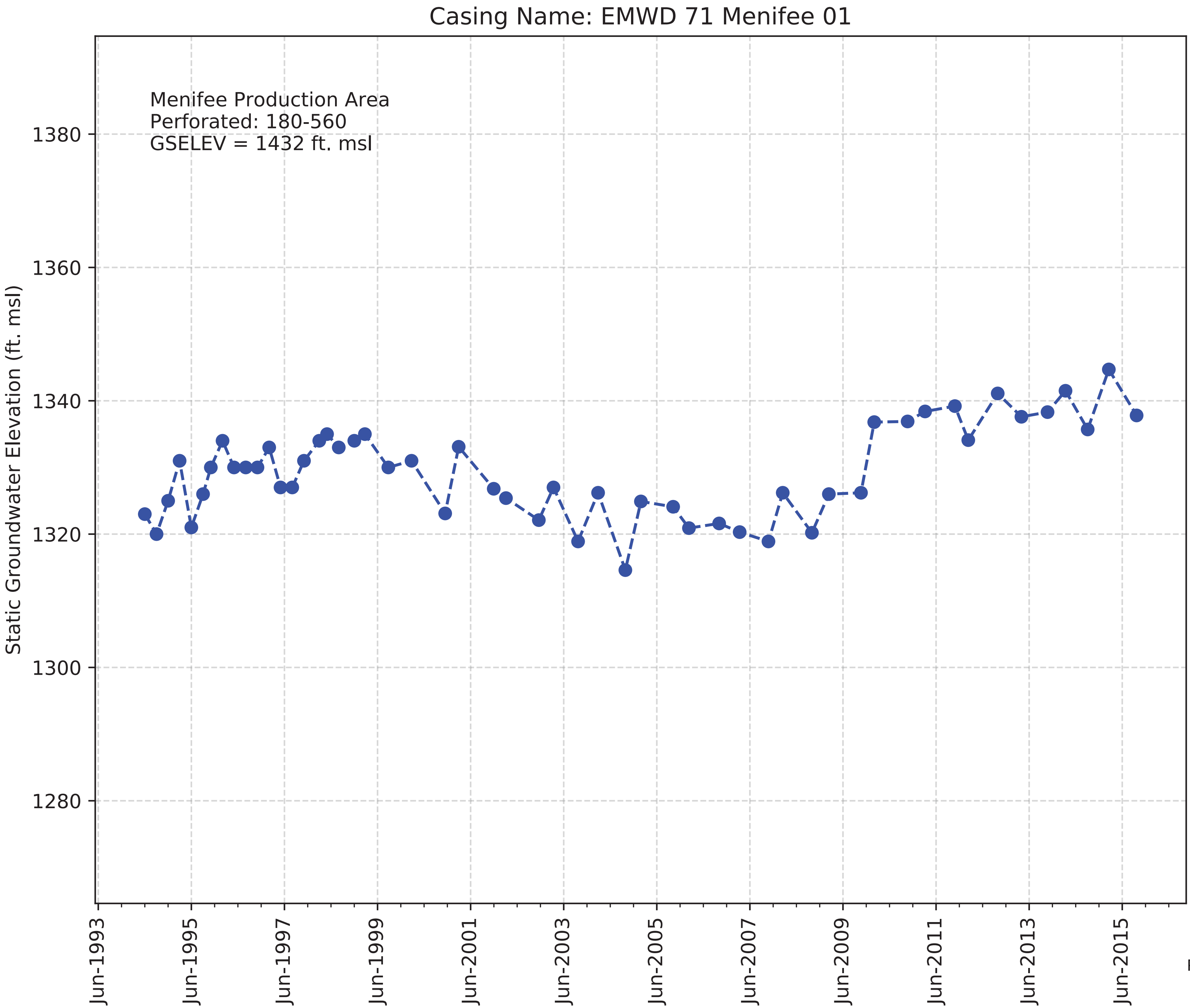

Casing Name: Ibarra, Raul
Menifee Production Area
Perforated: nan
GSELEV = 1431 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1450
1400
1350
1300
1250
1200
1150
Oct-1997
Oct-1999

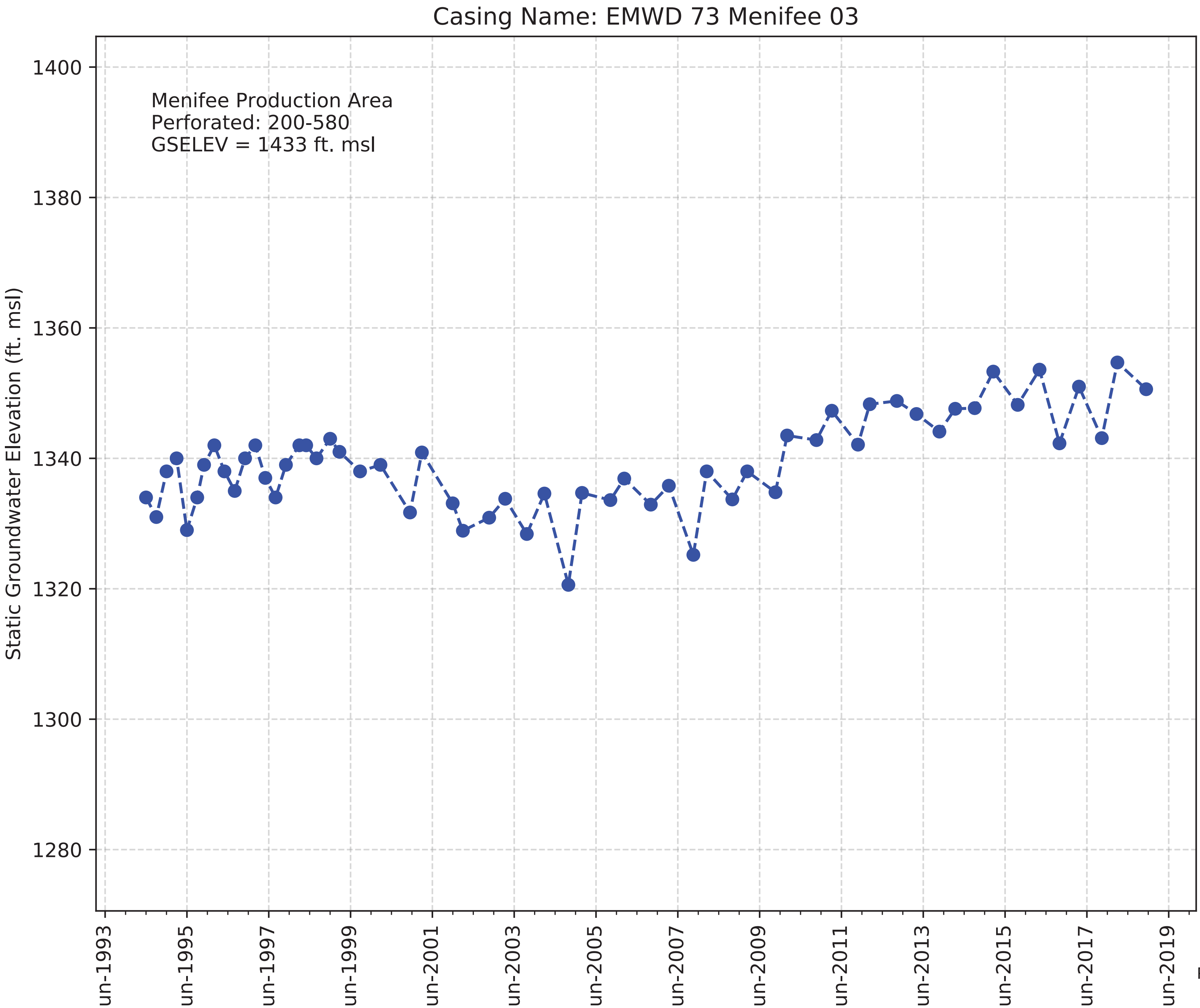

Casing Name: Hosang 01
Menifee Production Area
Perforated: nan
GSELEV = 1449 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
1320
Jan-1941
Jan-1943
Jan-1945
Jan-1947
Jan-1949
Jan-1951
Jan-1953

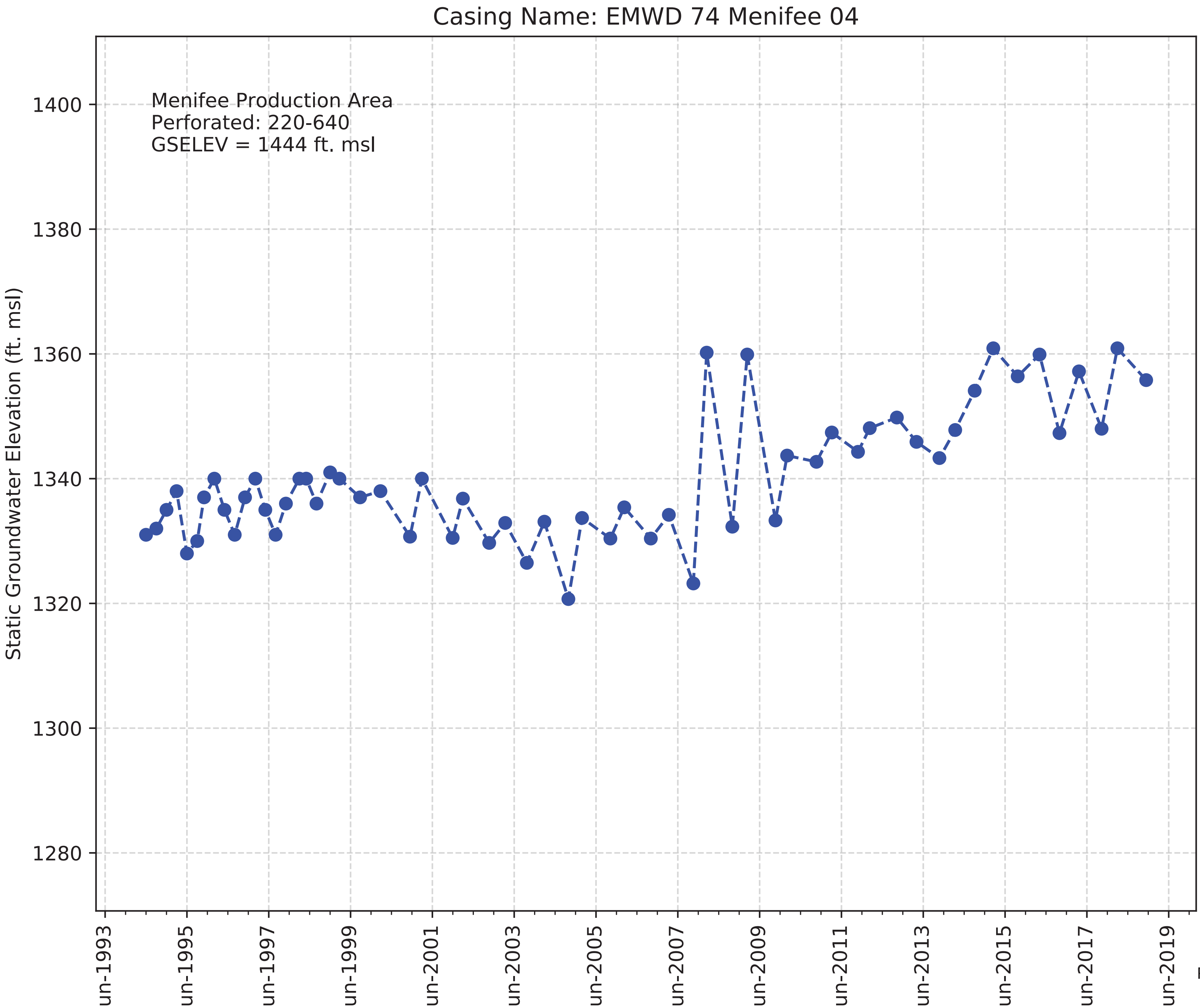

Casing Name: DeJong Dairy North
Menifee Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1375
1350
1325
1300
1275
1250
1225
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017

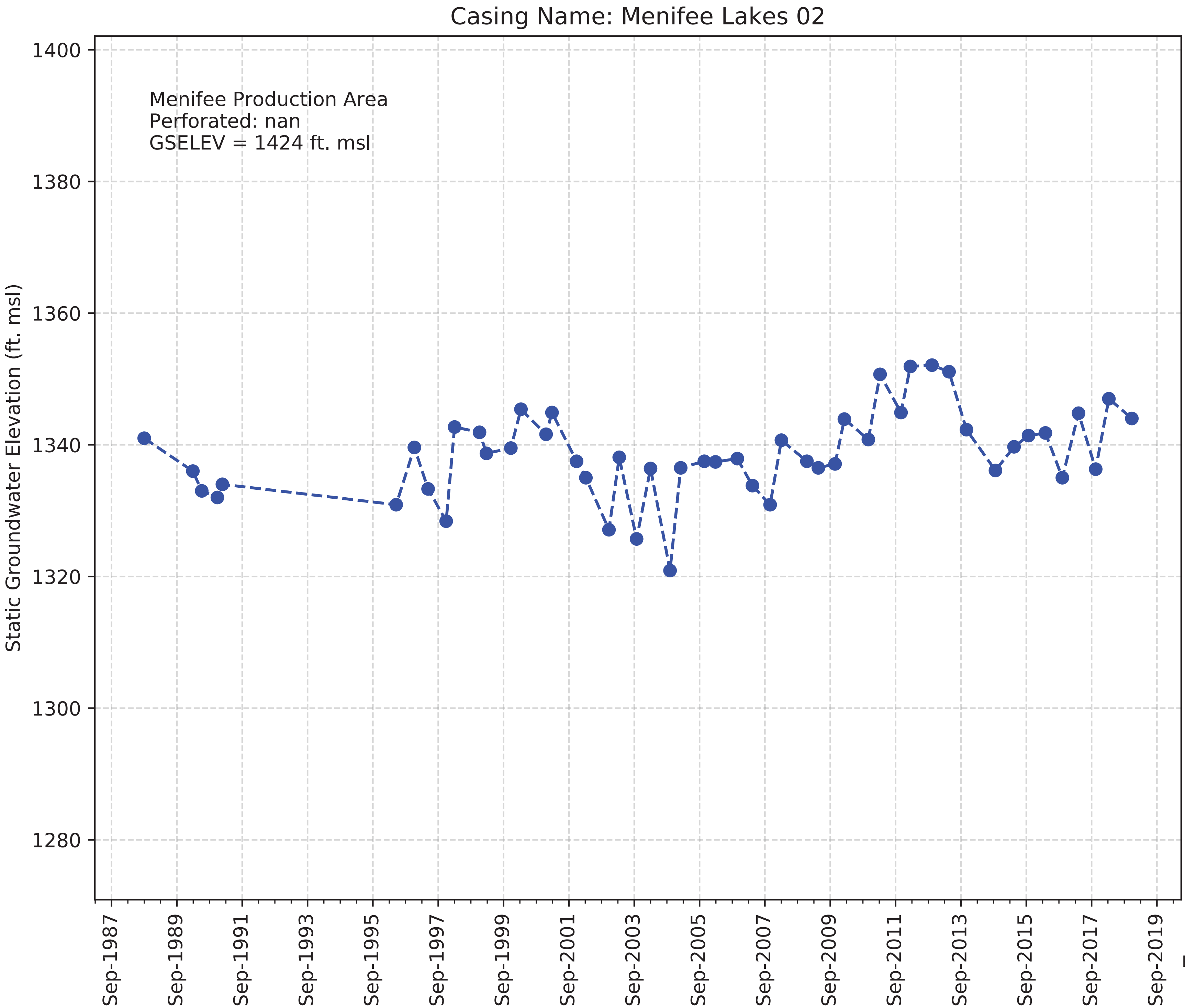

Casing Name: Wilderness Lakes
Menifee Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
1260
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016

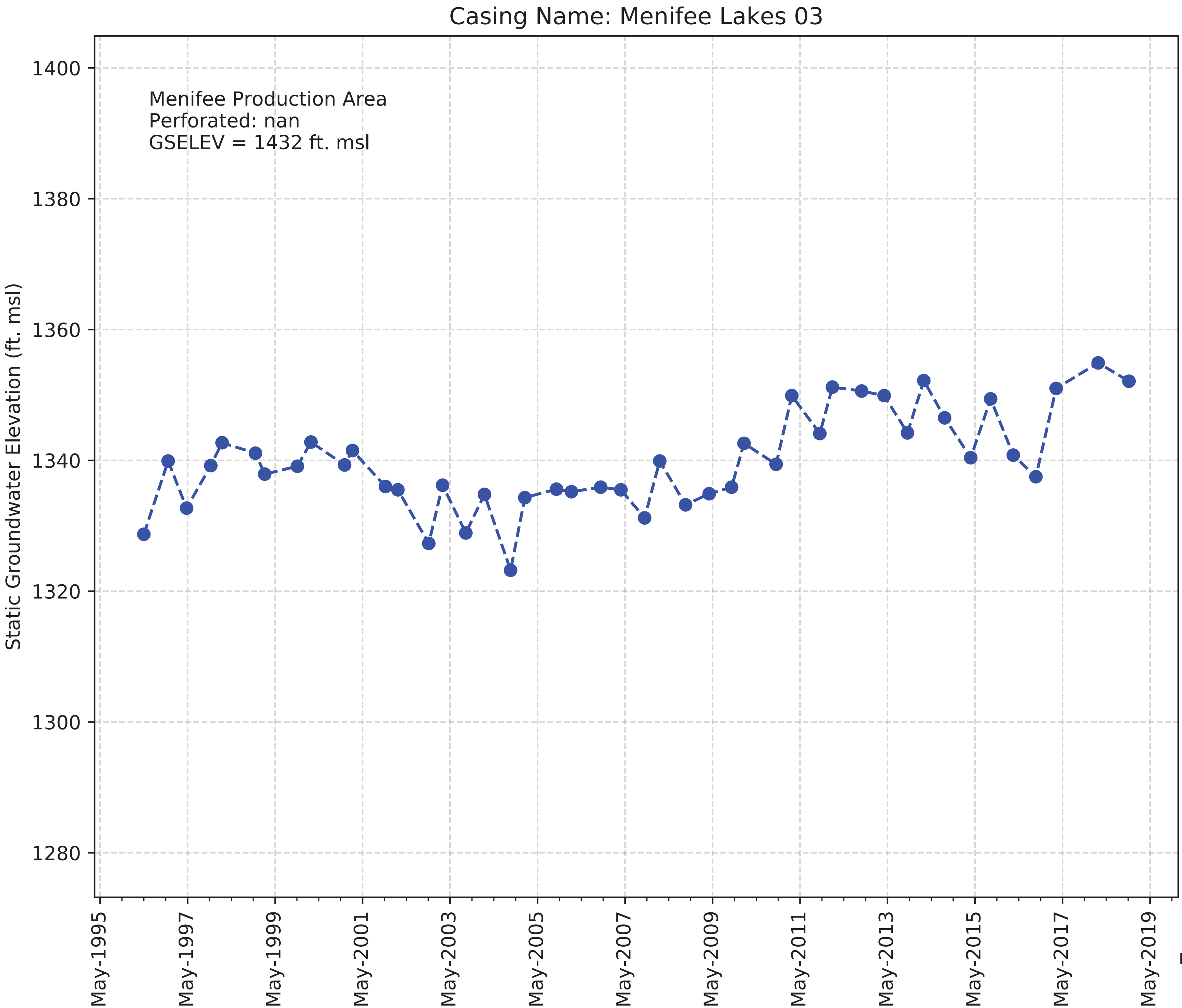

Casing Name: Bouris West of Wilderness Lakes
Menifee Production Area
Perforated: nan
GSELEV = 1427 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Nov-1997
Nov-1999
Nov-2001
Nov-2003

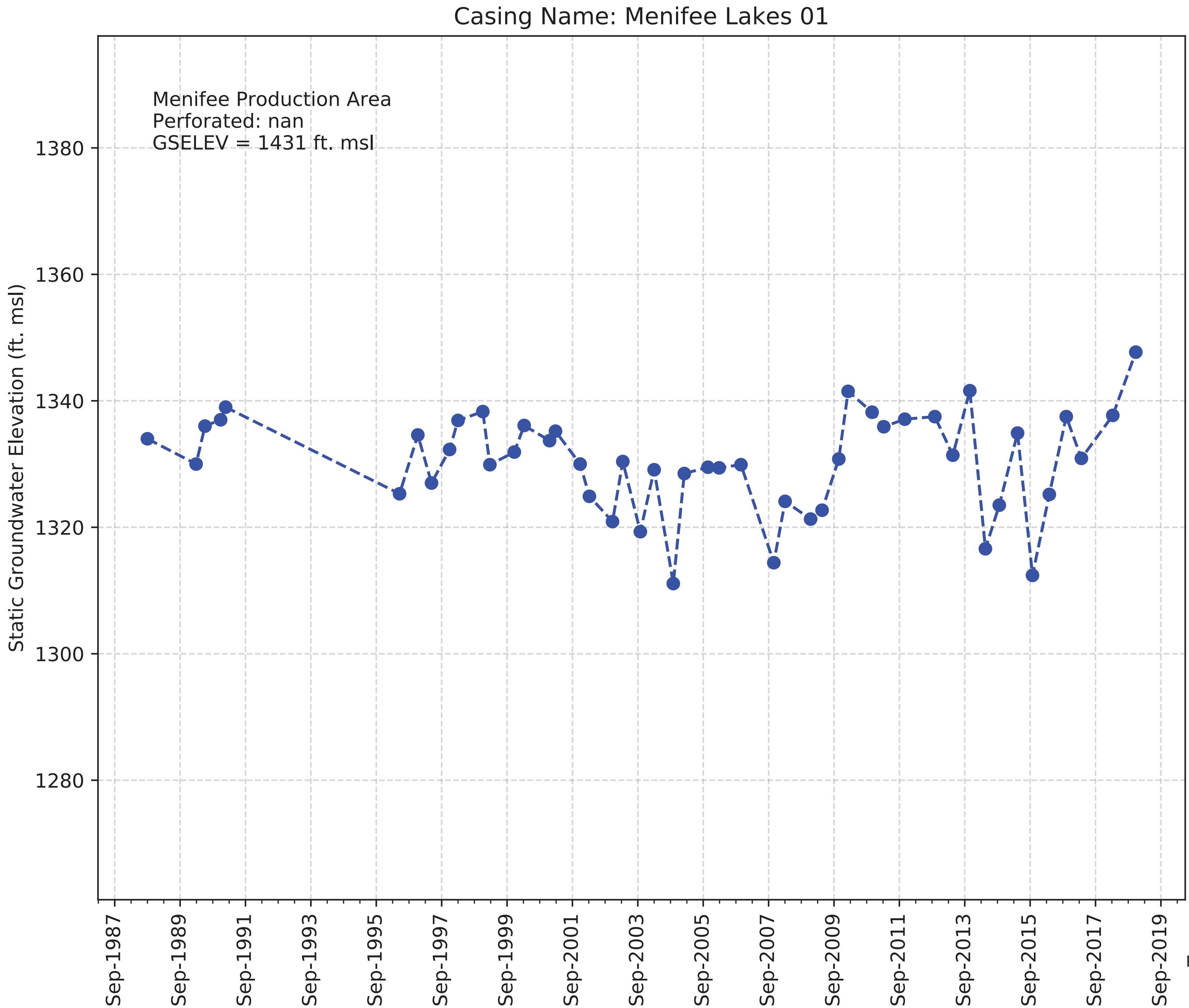

Casing Name: EMWD 71 Menifee 01
Menifee Production Area
Perforated: 180-560
GSELEV = 1432 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1300
1320
1340
1360
1380
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015

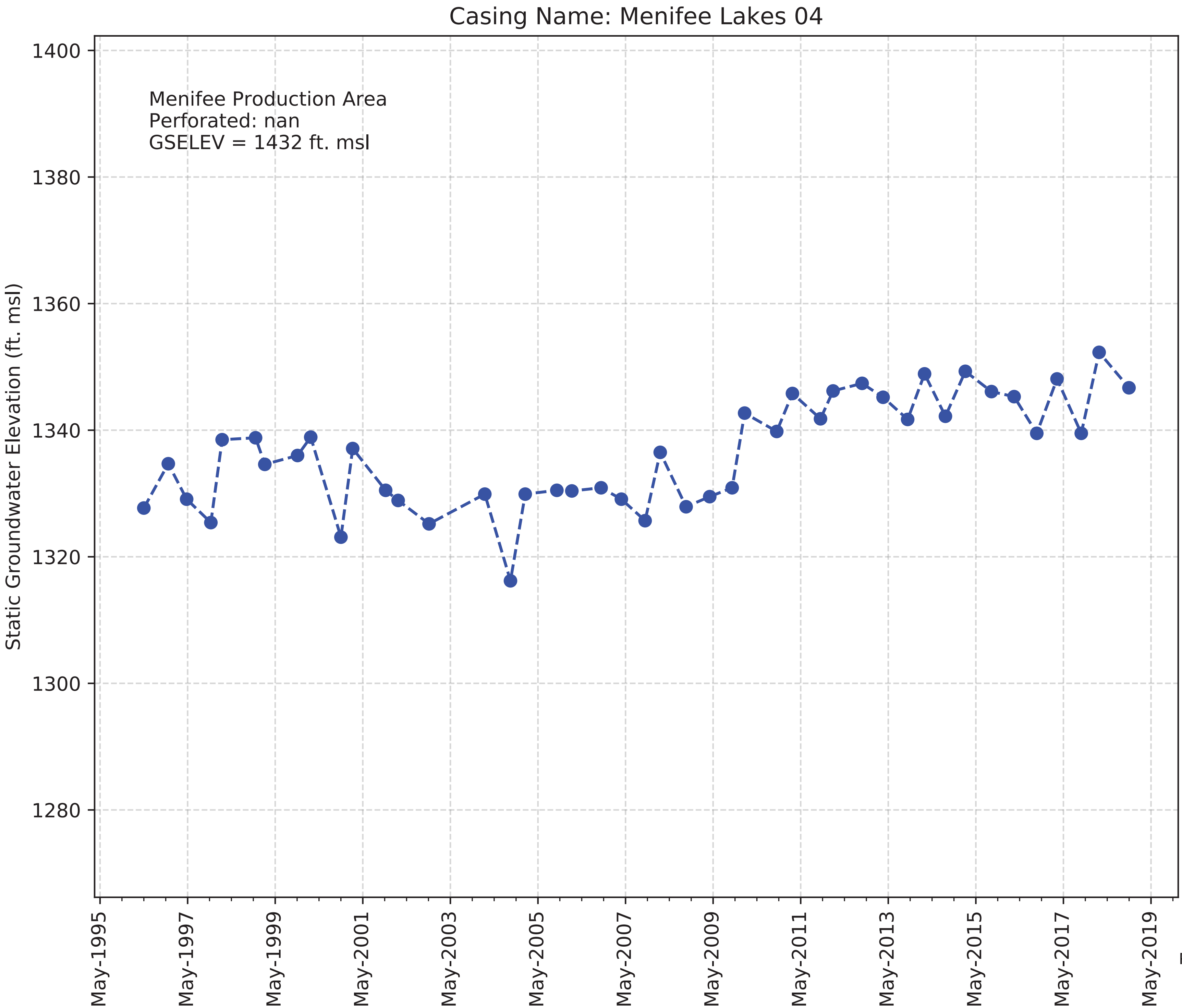

Casing Name: EMWD 73 Menifee 03
Menifee Production Area
Perforated: 200-580
GSELEV = 1433 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

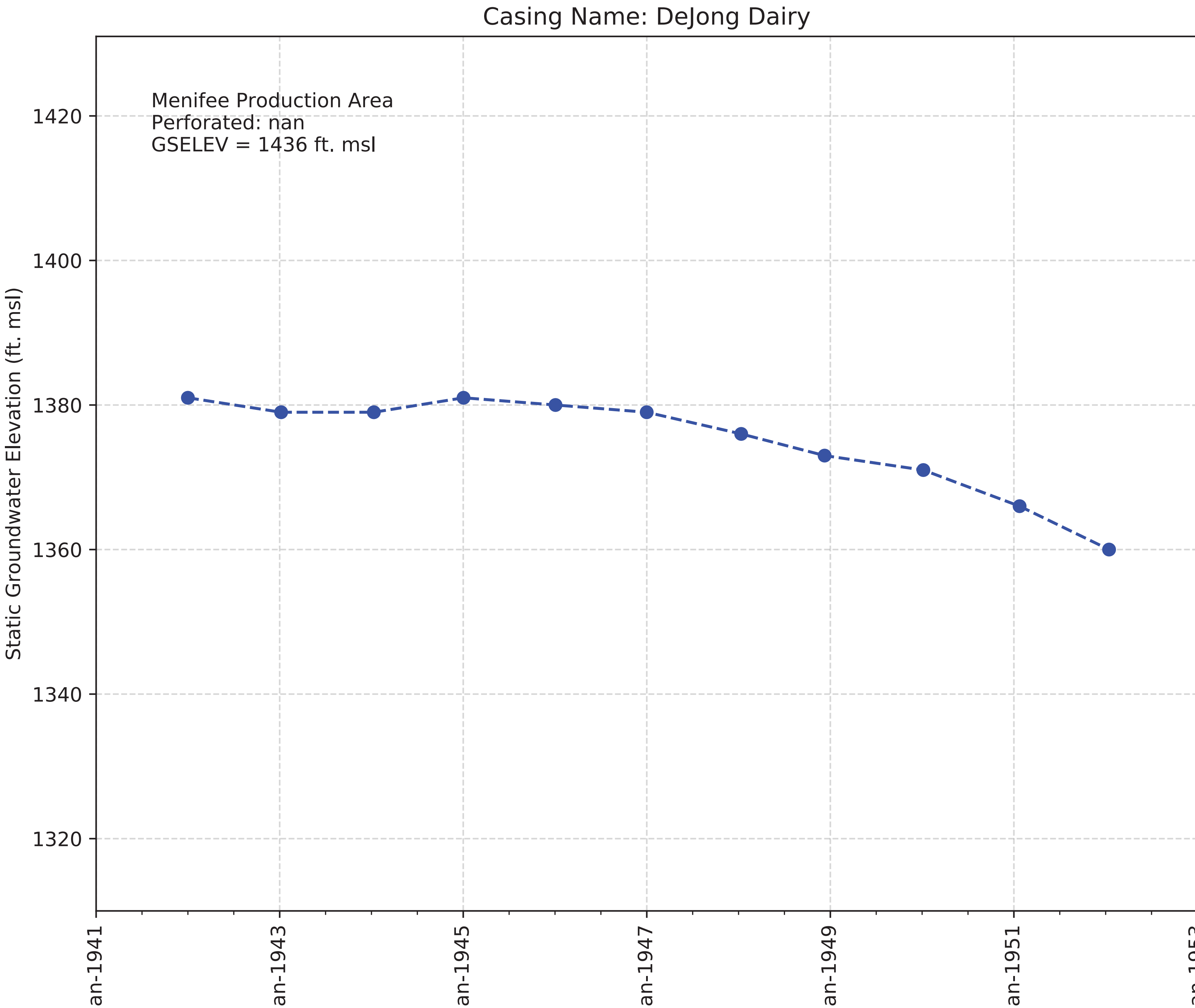

Casing Name: EMWD 74 Menifee 04
Menifee Production Area
Perforated: 220-640
GSELEV = 1444 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1300
1320
1340
1360
1380
1400
Jun-1993
Jun-1995
Jun-1997
Jun-1999
Jun-2001
Jun-2003
Jun-2005
Jun-2007
Jun-2009
Jun-2011
Jun-2013
Jun-2015
Jun-2017
Jun-2019

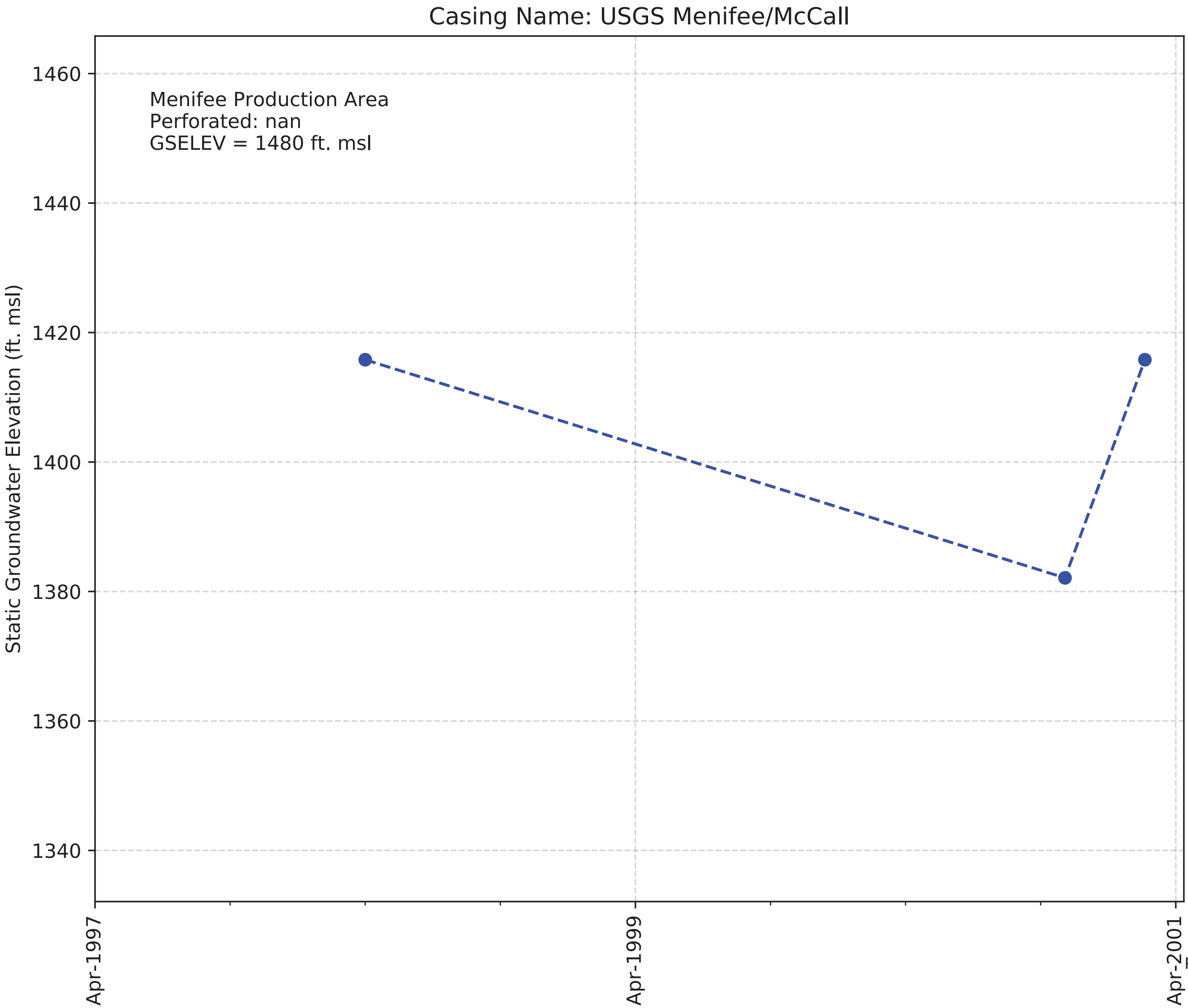

Casing Name: Menifee Lakes 02
Menifee Production Area
Perforated: nan
GSELEV = 1424 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
Sep-1987
Sep-1989
Sep-1991
Sep-1993
Sep-1995
Sep-1997
Sep-1999
Sep-2001
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015
Sep-2017
Sep-2019

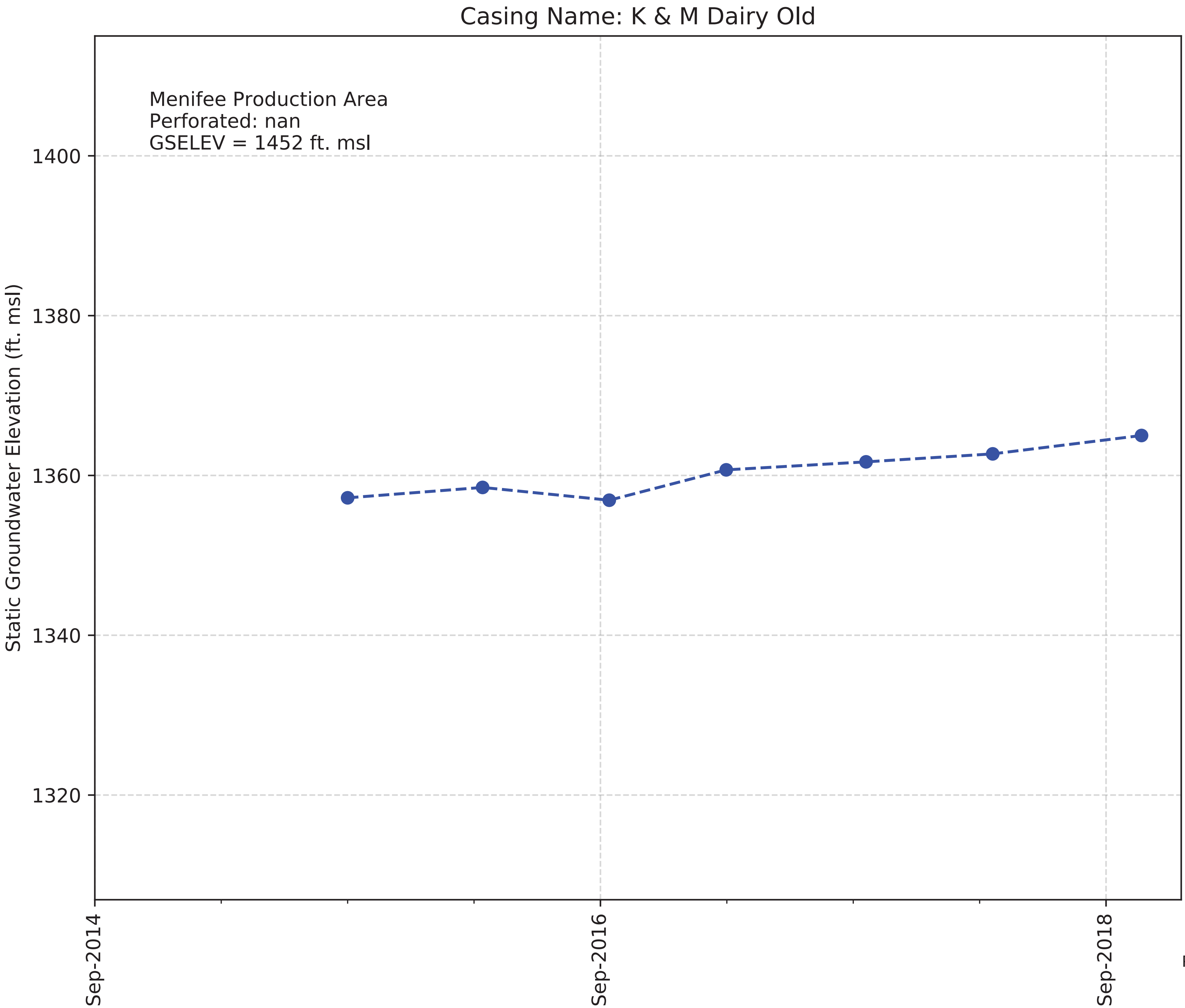

Casing Name: Menifee Lakes 03
Menifee Production Area
Perforated: nan
GSELEV = 1432 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007
May-2009
May-2011
May-2013
May-2015
May-2017
May-2019

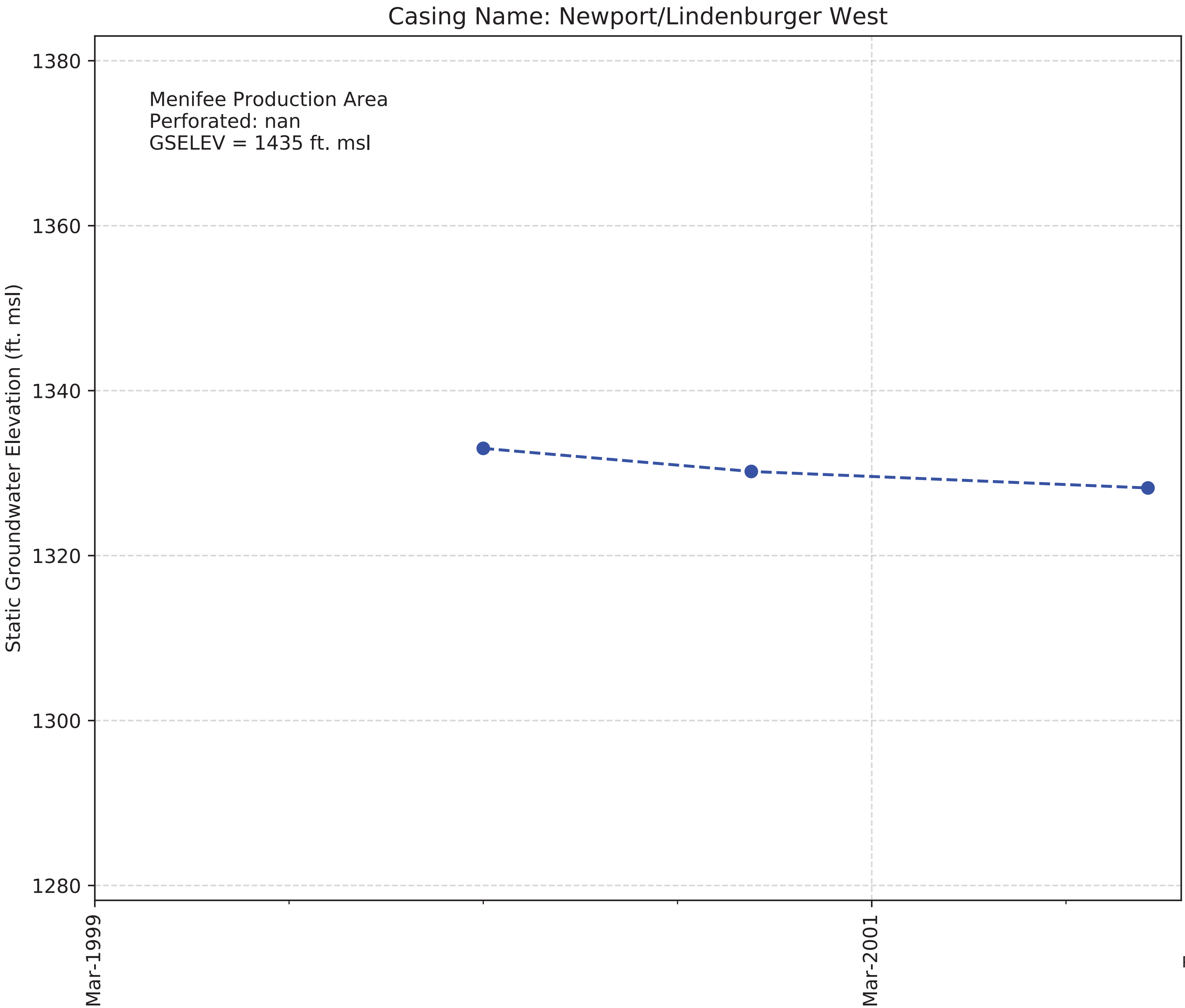

Casing Name: Menifee Lakes 01
Menifee Production Area
Perforated: nan
GSELEV = 1431 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Sep-1987
Sep-1989
Sep-1991
Sep-1993
Sep-1995
Sep-1997
Sep-1999
Sep-2001
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015
Sep-2017
Sep-2019

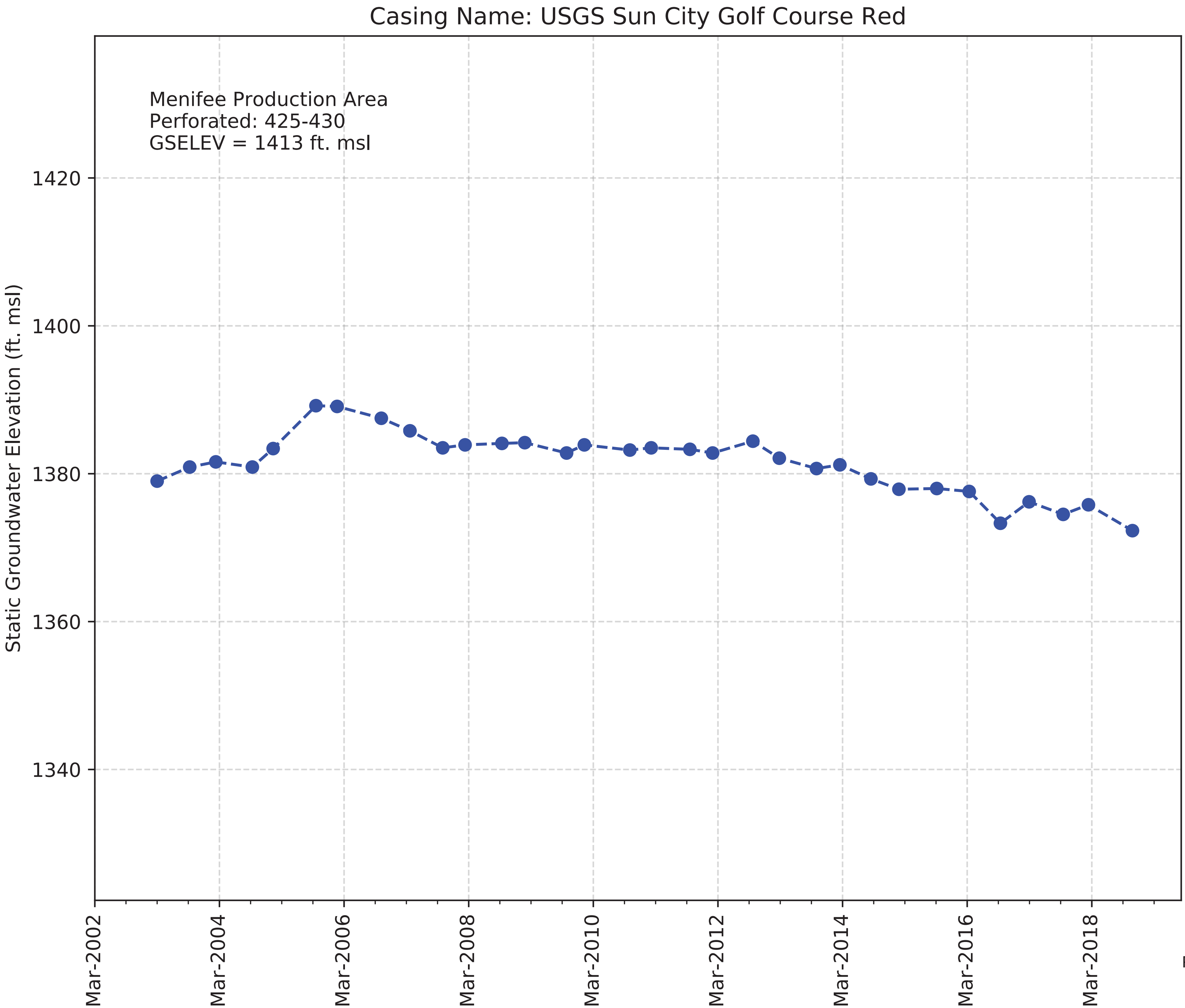

Casing Name: Menifee Lakes 04
Menifee Production Area
Perforated: nan
GSELEV = 1432 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
May-1995
May-1997
May-1999
May-2001
May-2003
May-2005
May-2007
May-2009
May-2011
May-2013
May-2015
May-2017
May-2019

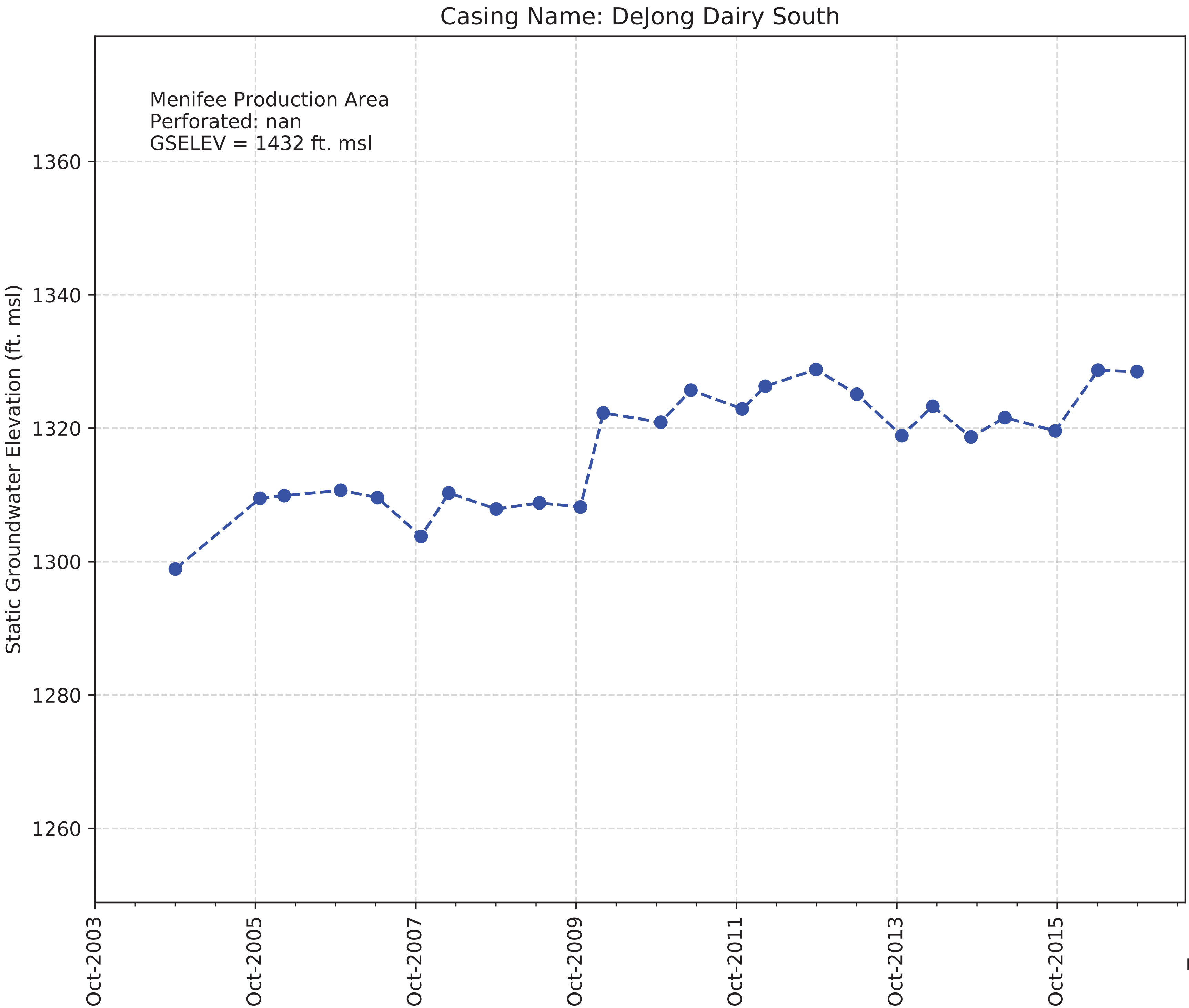

Casing Name: DeJong Dairy
Menifee Production Area
Perforated: nan
GSELEV = 1436 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
1320
Jan-1941
Jan-1943
Jan-1945
Jan-1947
Jan-1949
Jan-1951
Jan-1953

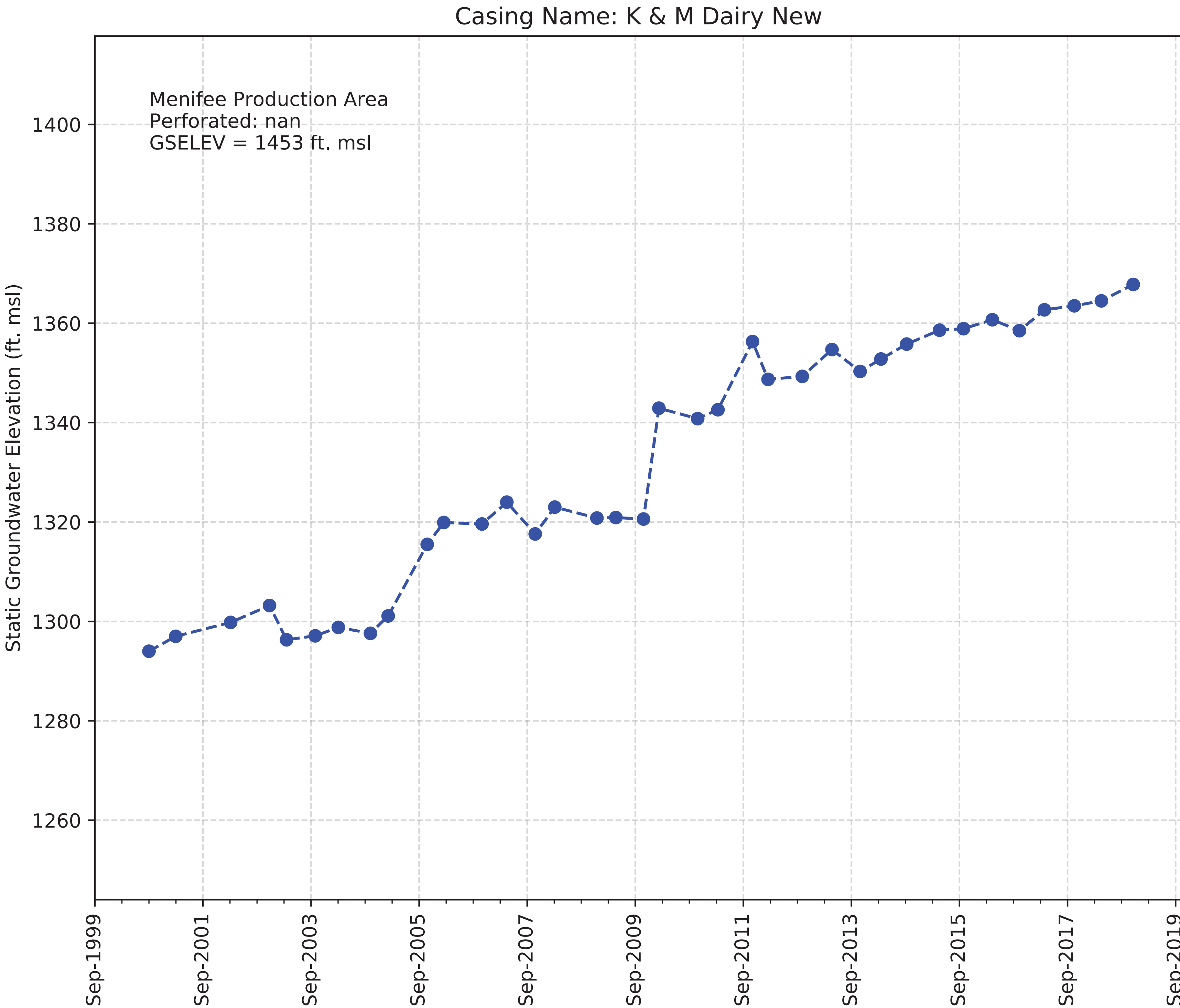

Casing Name: USGS Menifee/McCall
Menifee Production Area
Perforated: nan
GSELEV = 1480 ft. msl
Static Groundwater Elevation (ft. msl)
1460
1440
1420
1400
1380
1360
1340
Apr-1997
Apr-1999
Apr-2001

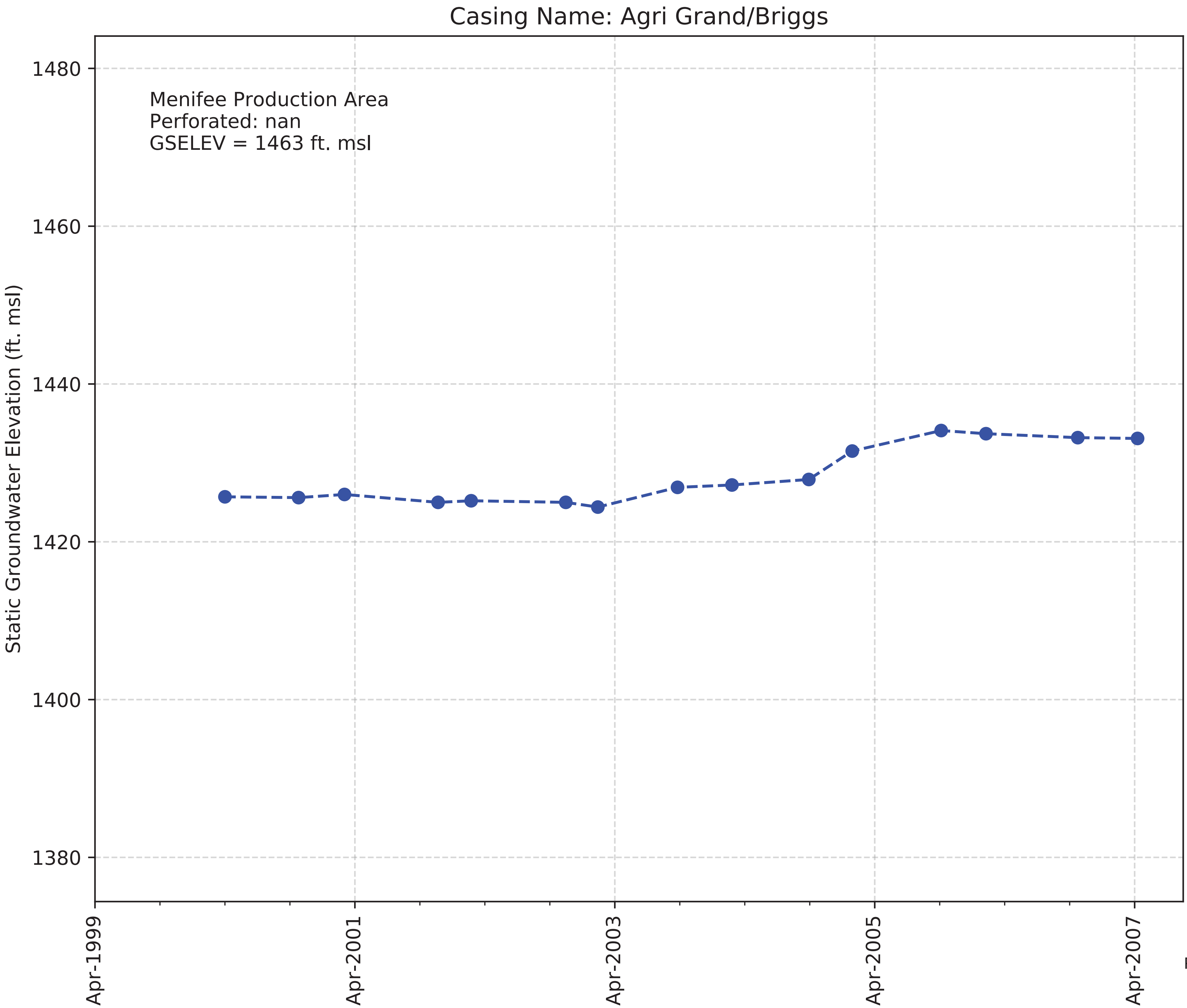

Casing Name: K & M Dairy Old
Menifee Production Area
Perforated: nan
GSELEV = 1452 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
Sep-2014
Sep-2016
Sep-2018

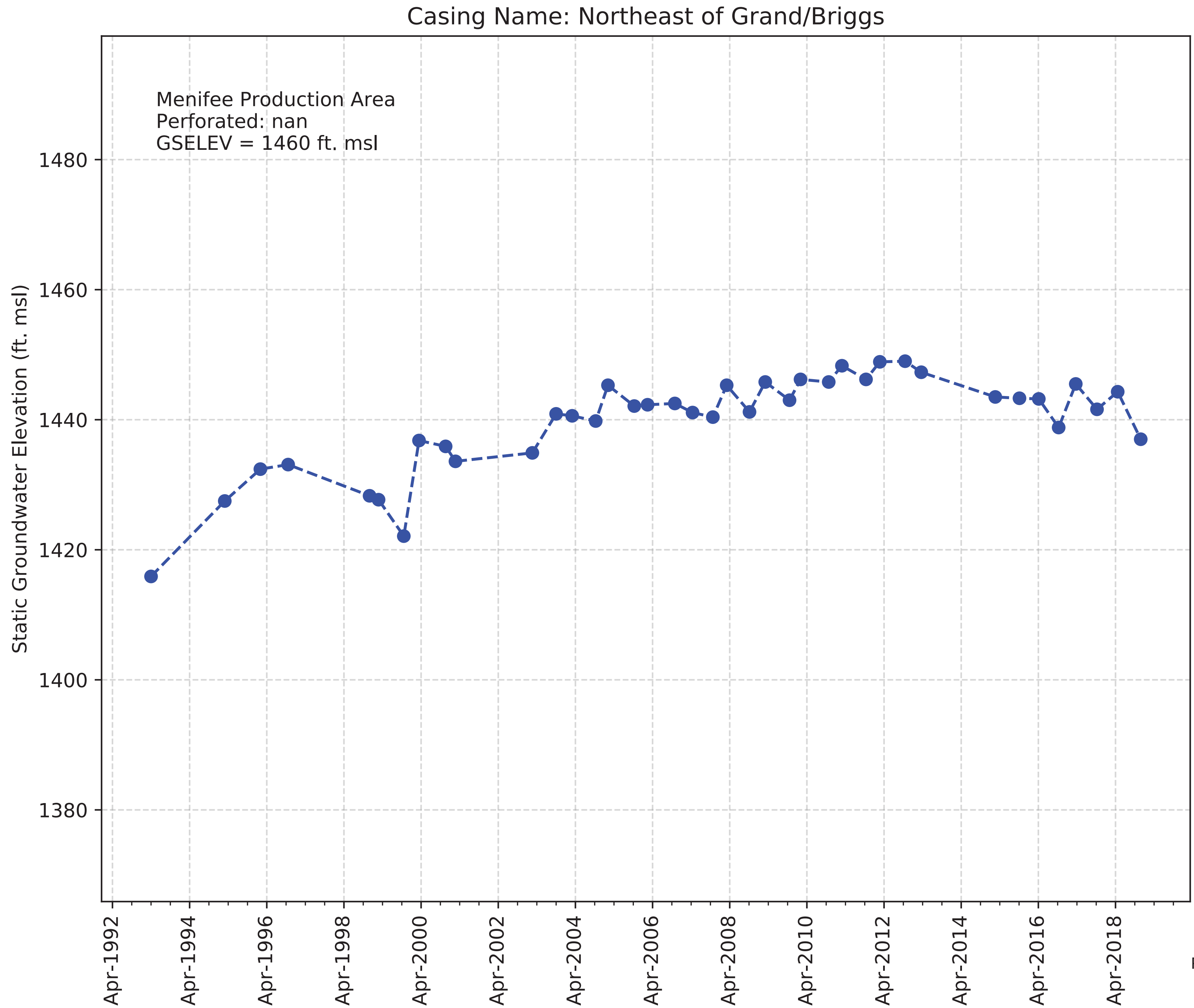

Casing Name: Newport/Lindenburger West
Menifee Production Area
Perforated: nan
GSELEV = 1435 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Mar-1999
Mar-2001

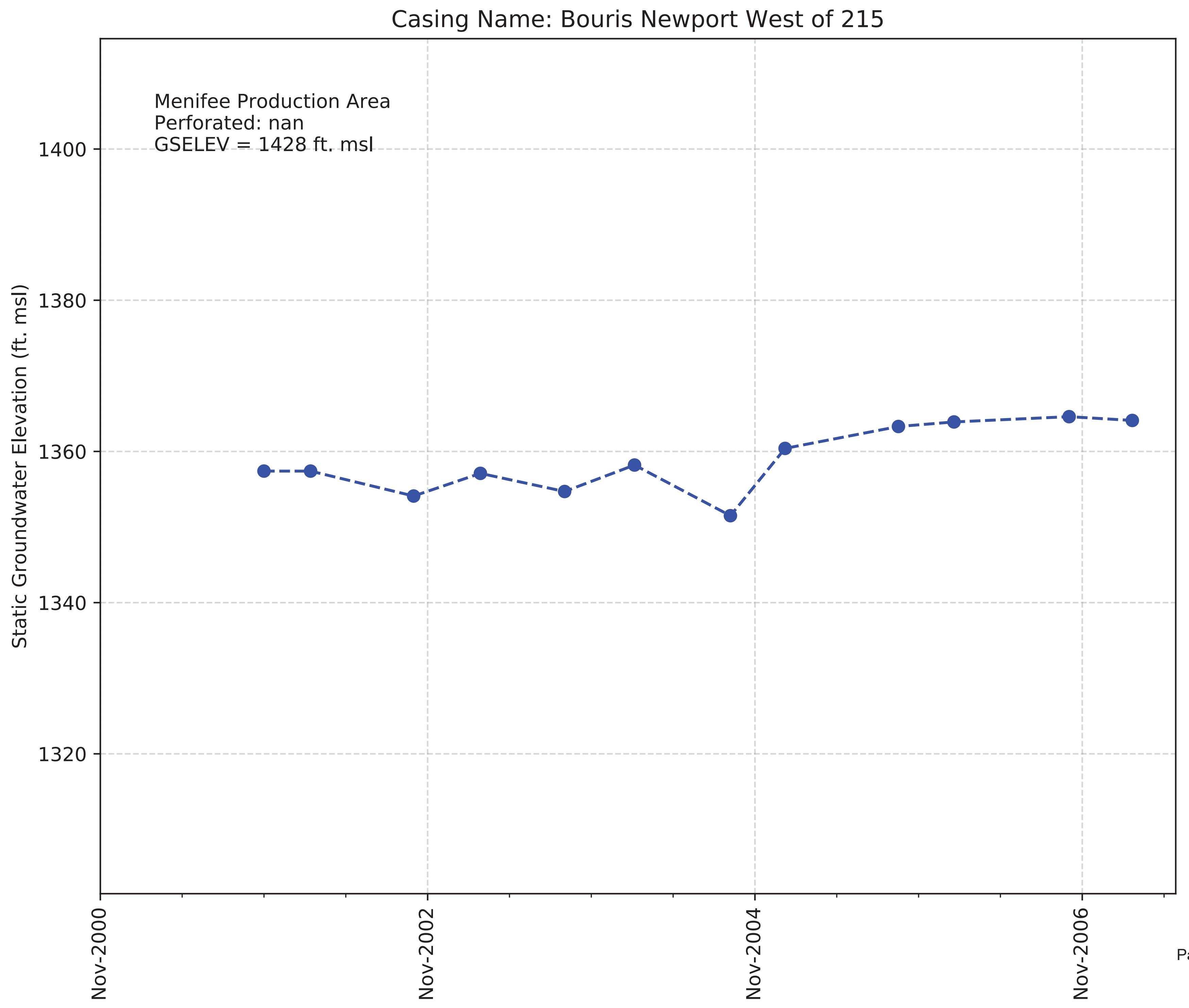

Casing Name: USGS Sun City Golf Course Red
Menifee Production Area
Perforated: 425-430
GSELEV = 1413 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

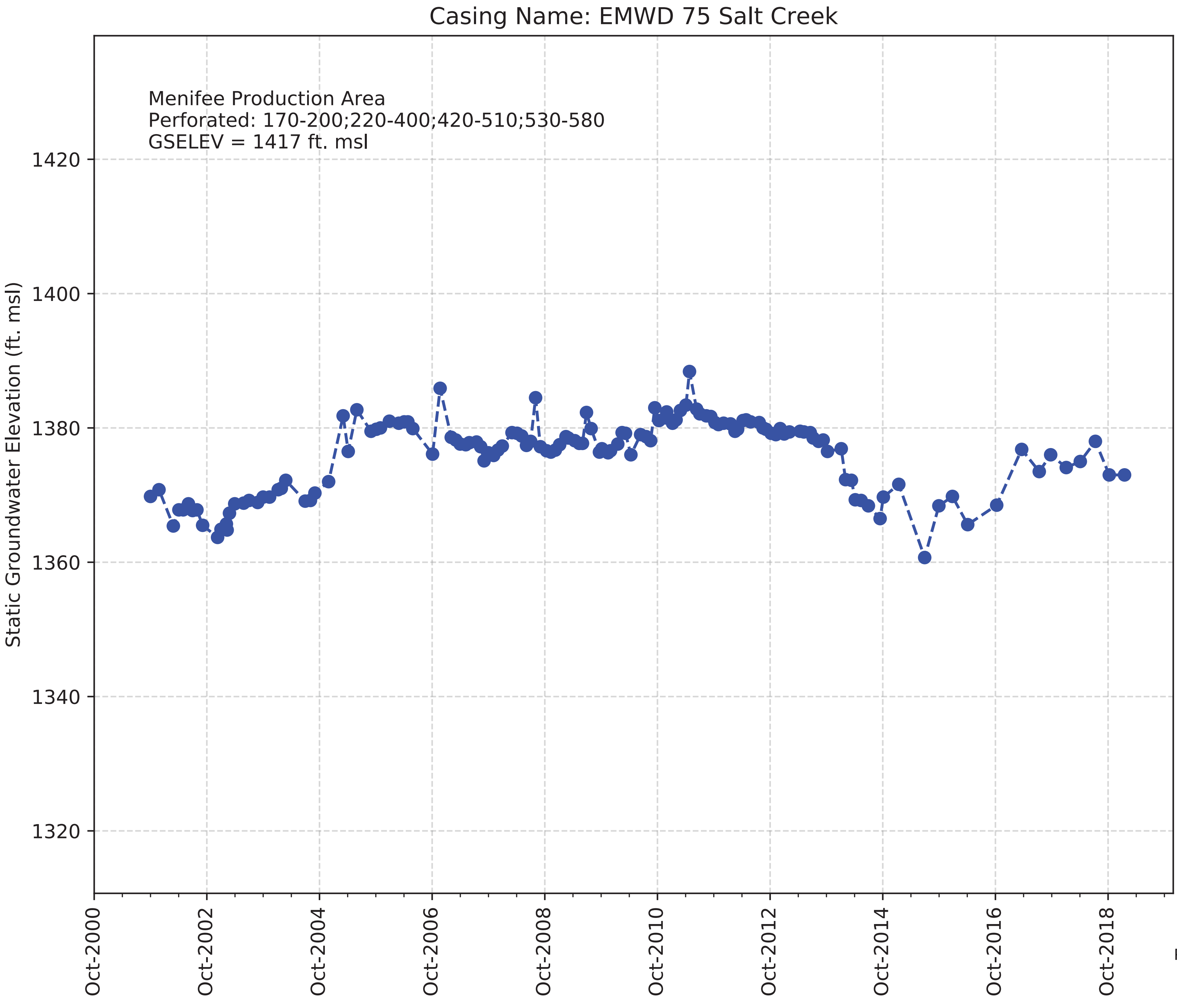

Casing Name: DeJong Dairy South
Menifee Production Area
Perforated: nan
GSELEV = 1432 ft. msl
Static Groundwater Elevation (ft. msl)
1360
1340
1320
1300
1280
1260
Oct-2003
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015

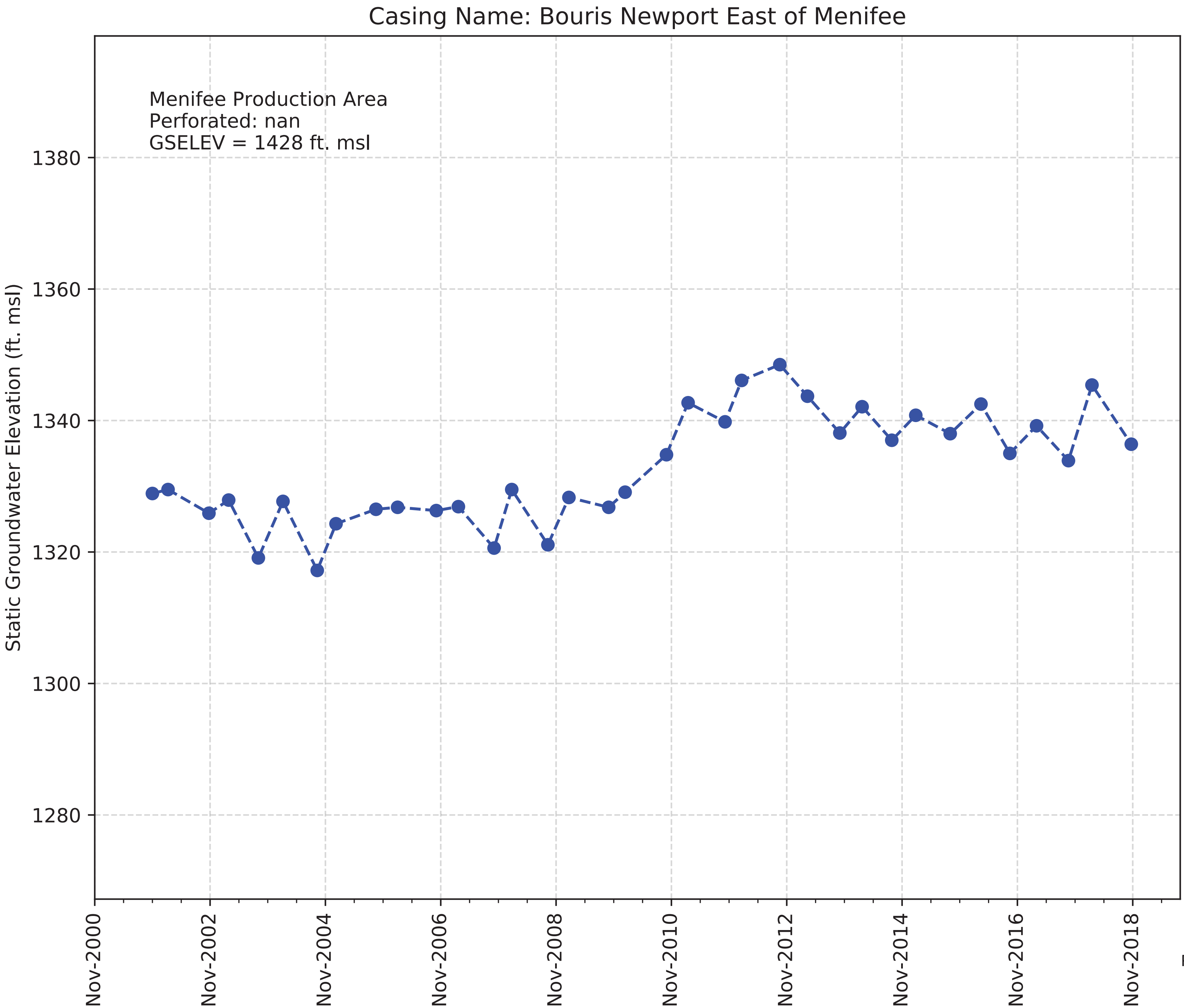

Casing Name: K & M Dairy New
Menifee Production Area
Perforated: nan
GSELEV = 1453 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
1300
1280
1260
Sep-1999
Sep-2001
Sep-2003
Sep-2005
Sep-2007
Sep-2009
Sep-2011
Sep-2013
Sep-2015
Sep-2017
Sep-2019

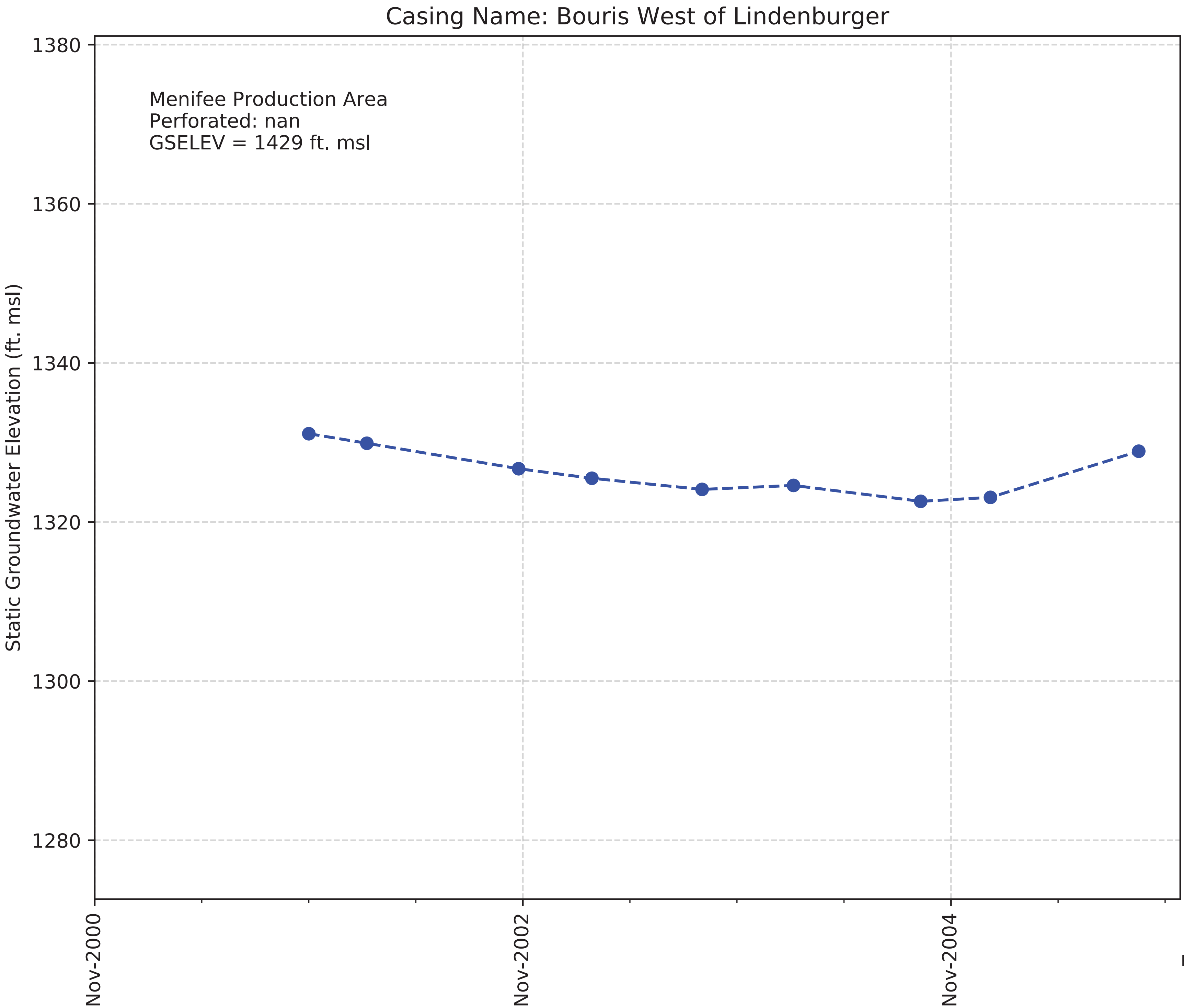

Casing Name: Agri Grand/Briggs
Menifee Production Area
Perforated: nan
GSELEV = 1463 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
Apr-1999
Apr-2001
Apr-2003
Apr-2005
Apr-2007

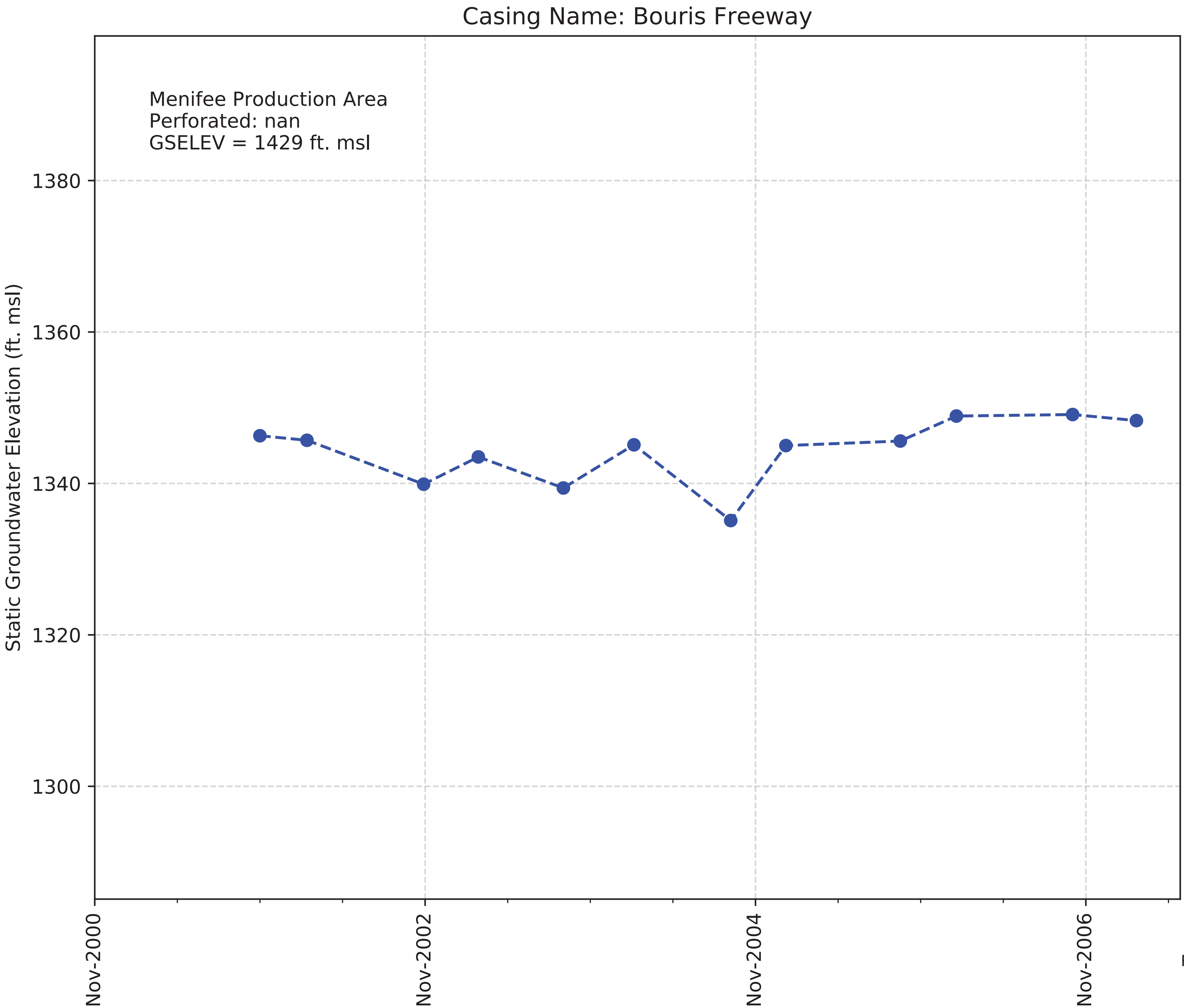

Casing Name: Northeast of Grand/Briggs
Menifee Production Area
Perforated: nan
GSELEV = 1460 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
Apr-1992
Apr-1994
Apr-1996
Apr-1998
Apr-2000
Apr-2002
Apr-2004
Apr-2006
Apr-2008
Apr-2010
Apr-2012
Apr-2014
Apr-2016
Apr-2018

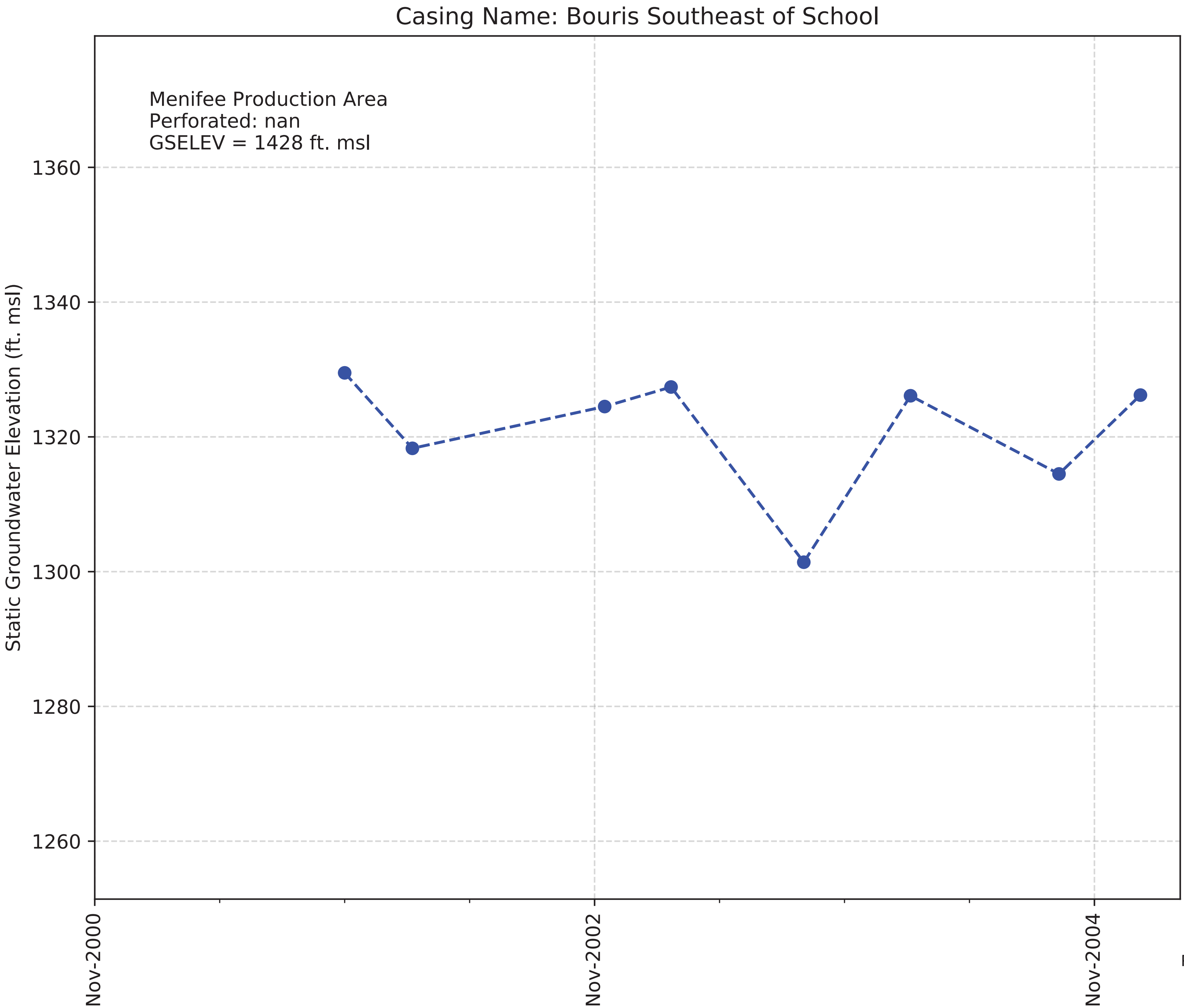

Casing Name: Bouris Newport West of 215
Menifee Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1400
1380
1360
1340
1320
Nov-2000
Nov-2002
Nov-2004
Nov-2006

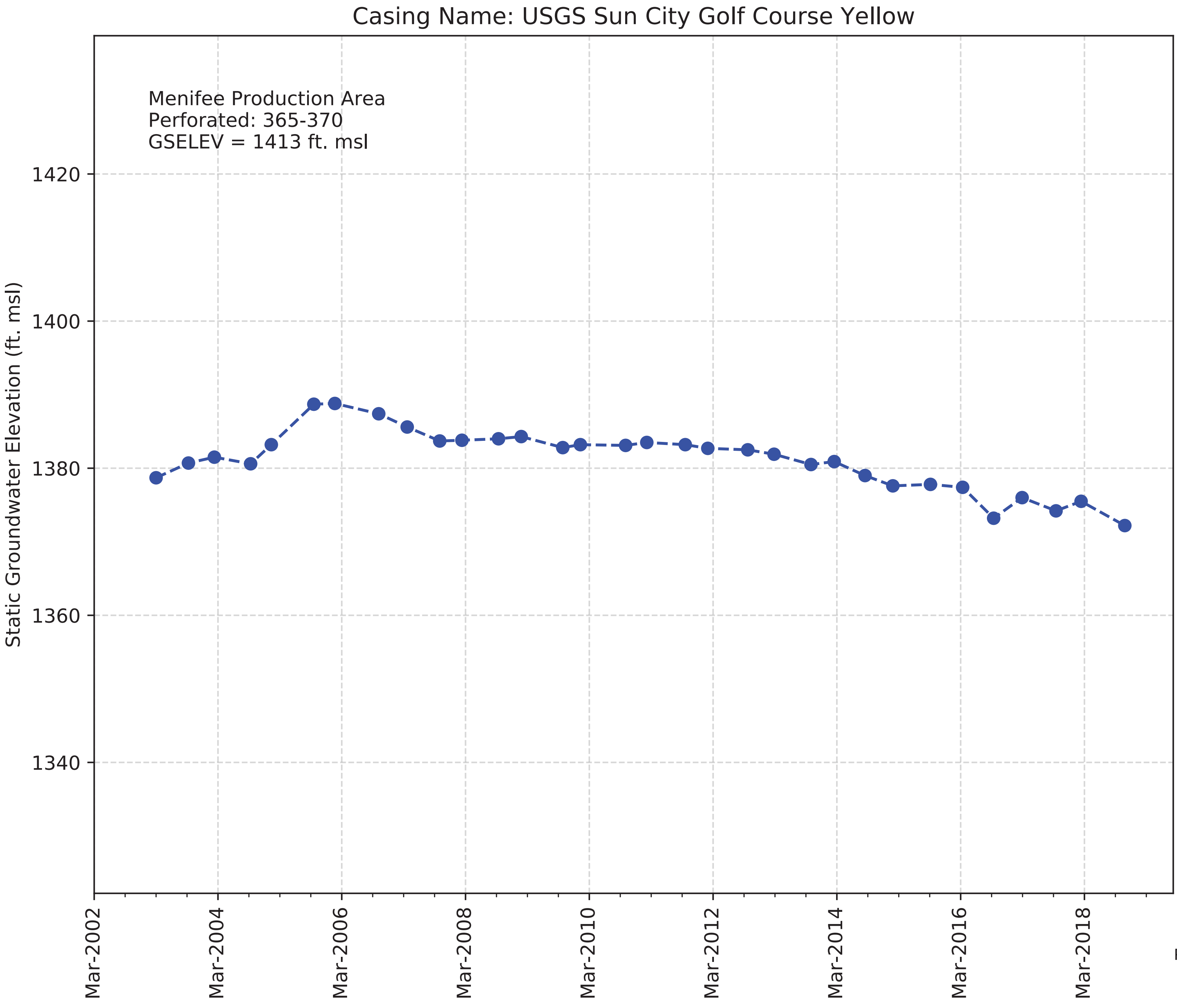

Casing Name: EMWD 75 Salt Creek
Menifee Production Area
Perforated: 170-200;220-400;420-510;530-580
GSELEV = 1417 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
1320
Oct-2000
Oct-2002
Oct-2004
Oct-2006
Oct-2008
Oct-2010
Oct-2012
Oct-2014
Oct-2016
Oct-2018

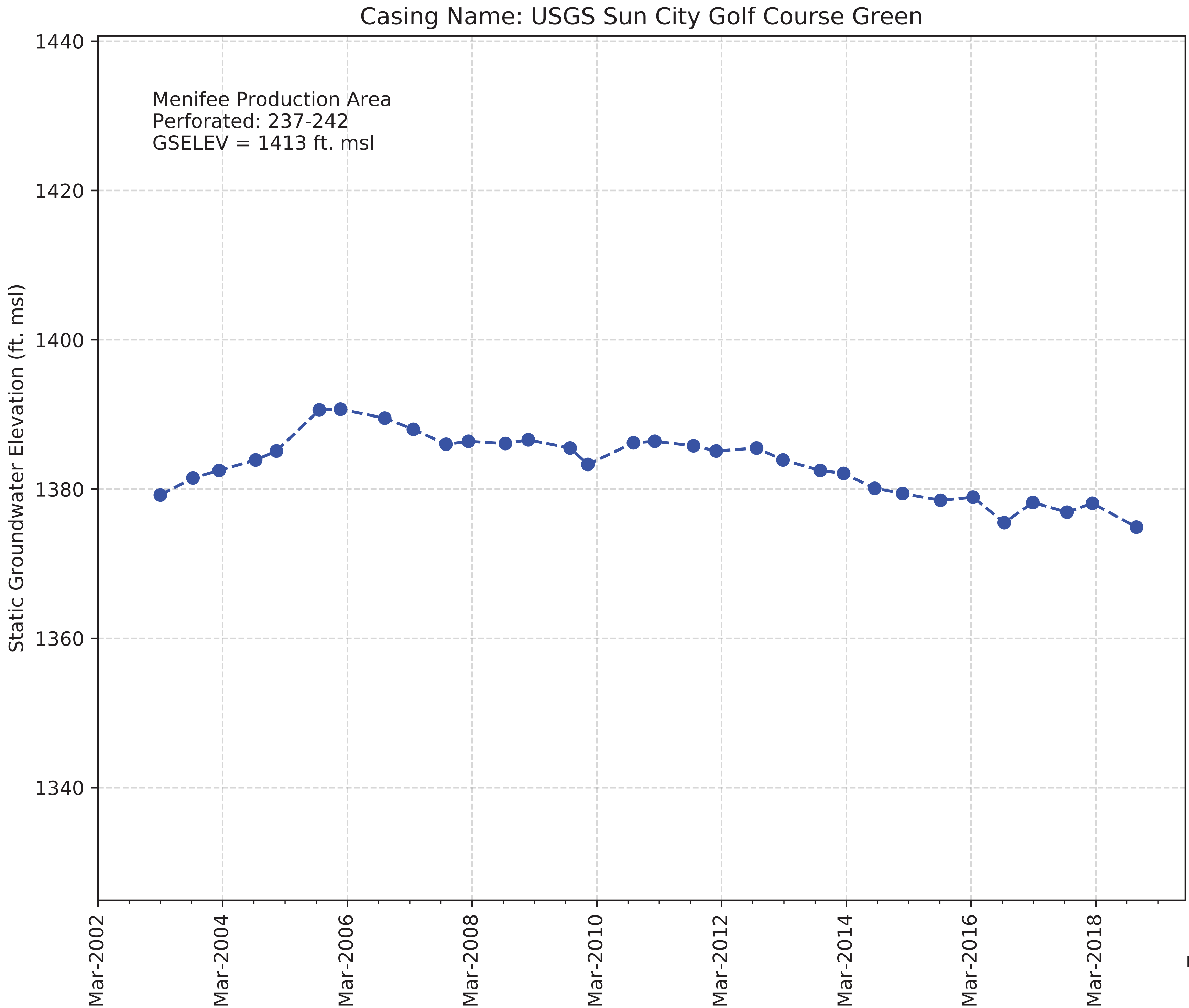

Casing Name: Bouris Newport East of Menifee
Menifee Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1280
1300
1320
1340
1360
1380
Nov-2000
Nov-2002
Nov-2004
Nov-2006
Nov-2008
Nov-2010
Nov-2012
Nov-2014
Nov-2016
Nov-2018

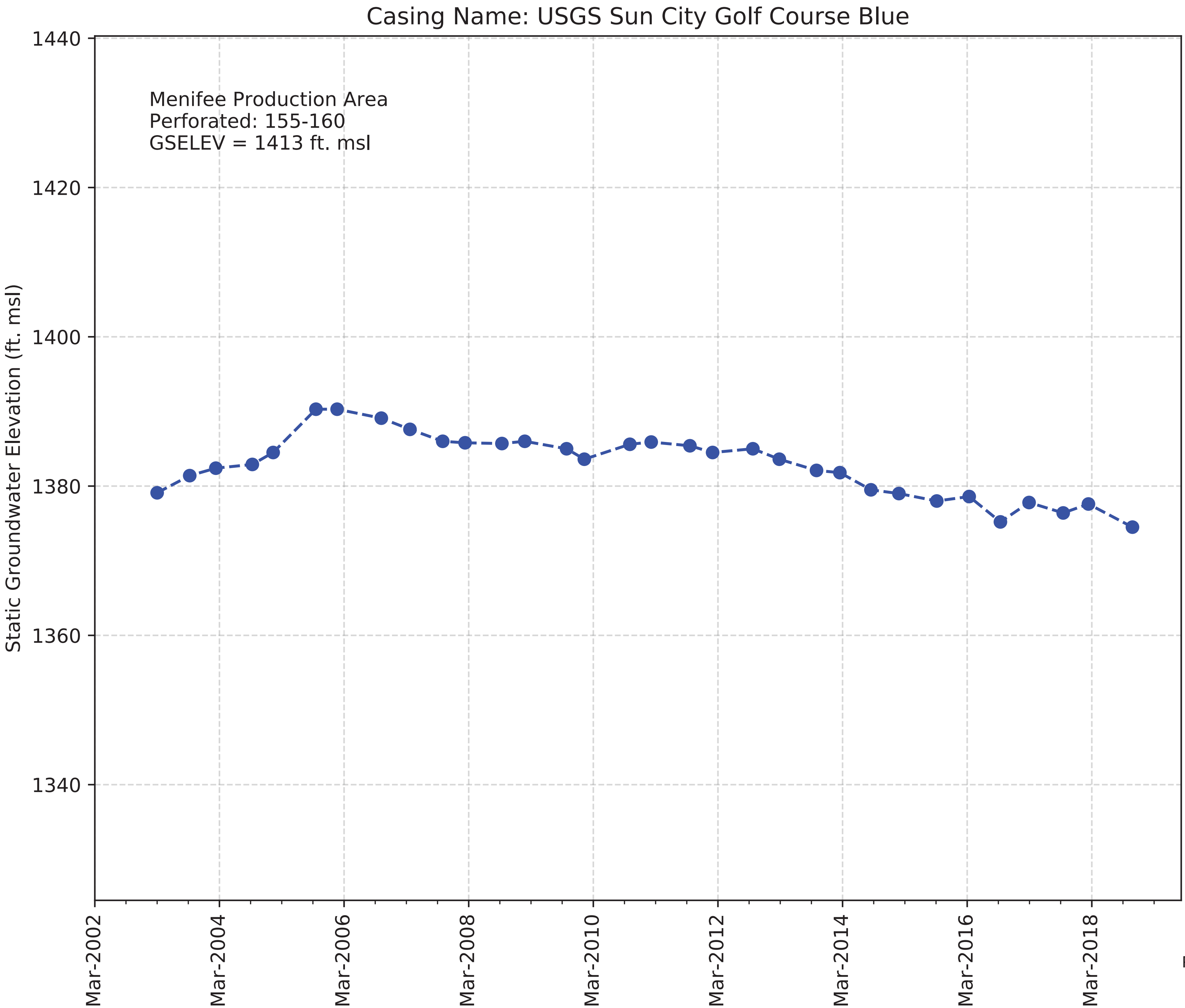

Casing Name: Bouris West of Lindenburger
Menifee Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
1280
Nov-2000
Nov-2002
Nov-2004

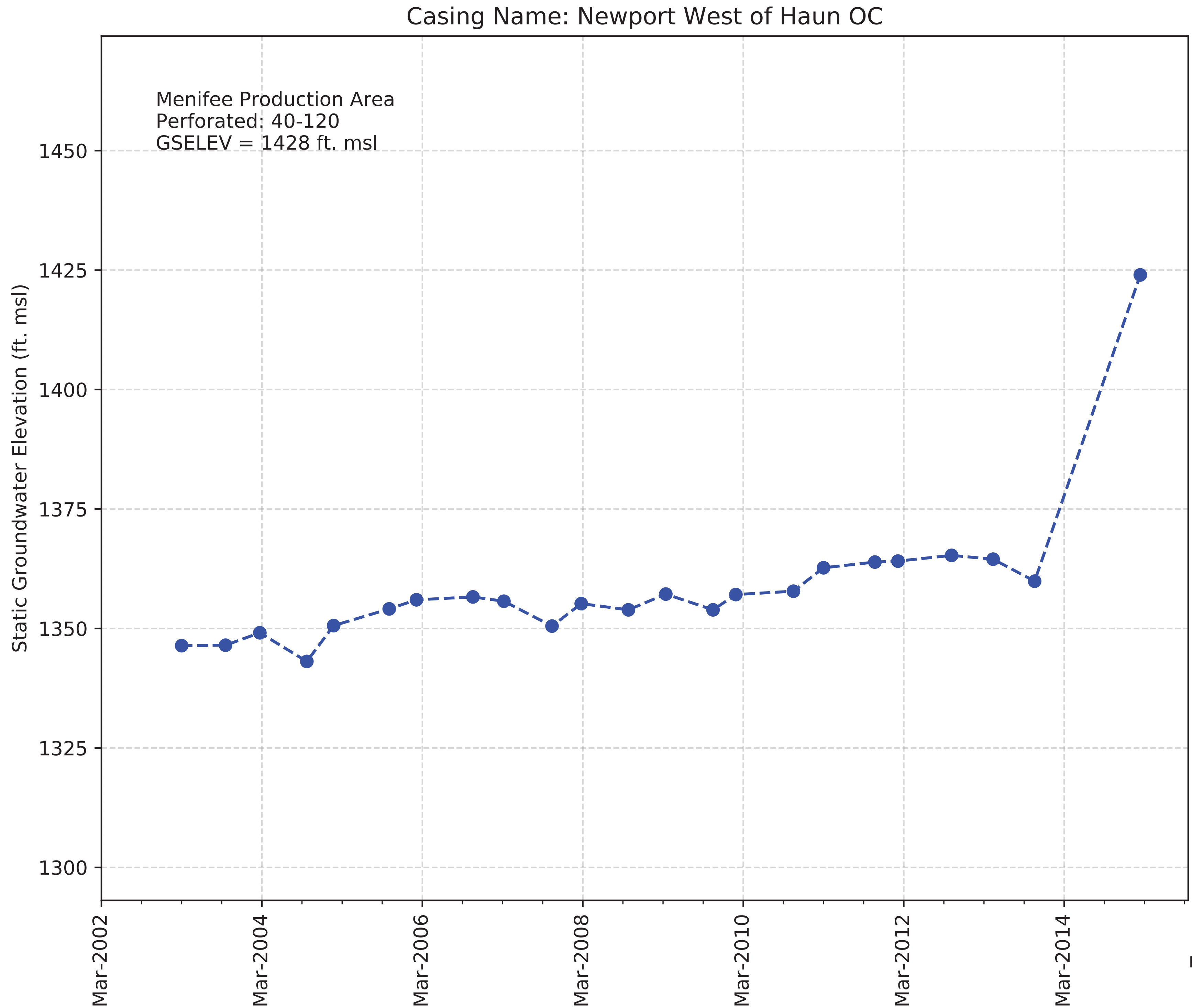

Casing Name: Bouris Freeway
Menifee Production Area
Perforated: nan
GSELEV = 1429 ft. msl
Static Groundwater Elevation (ft. msl)
1380
1360
1340
1320
1300
Nov-2000
Nov-2002
Nov-2004
Nov-2006

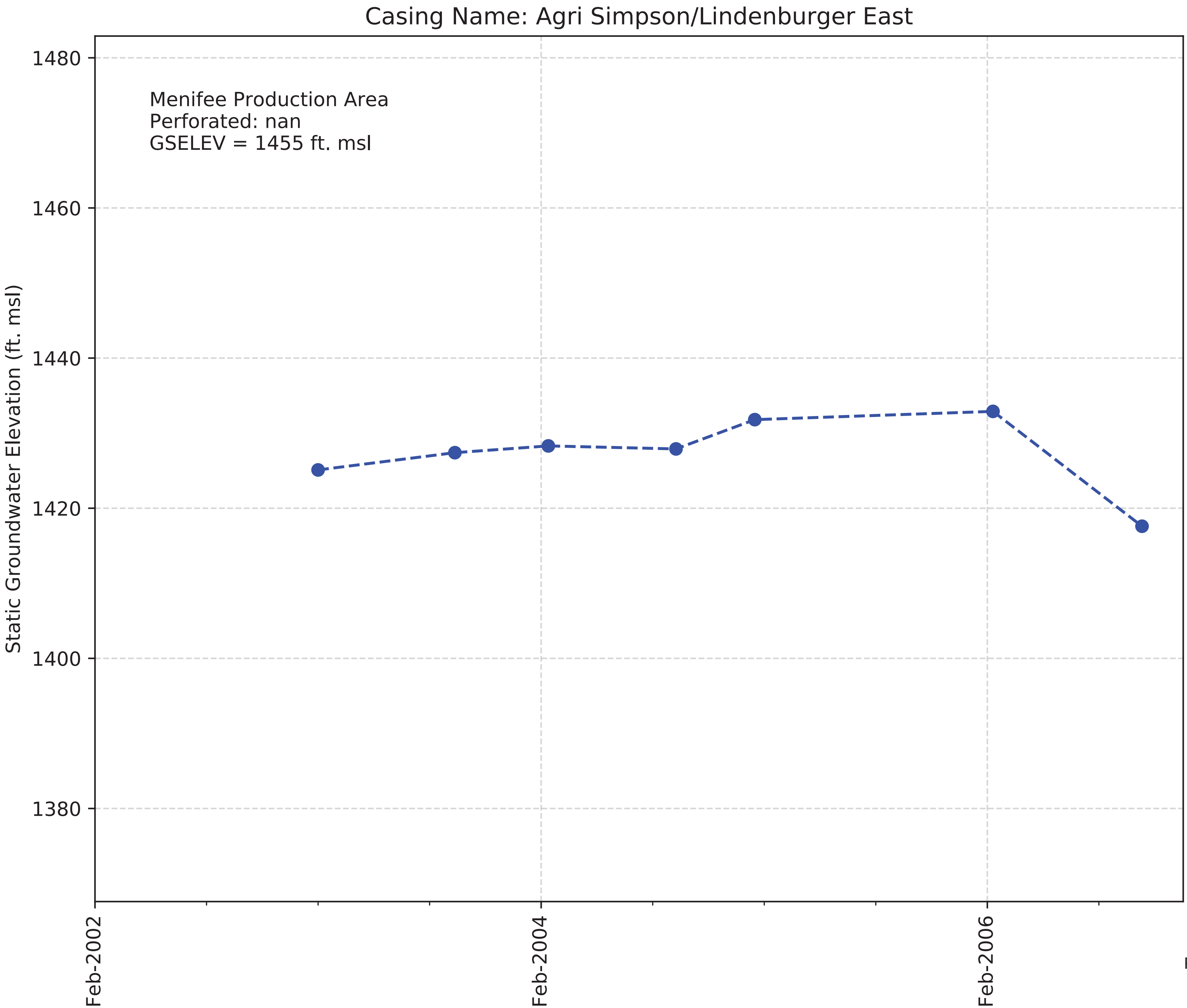

Casing Name: Bouris Southeast of School
Menifee Production Area
Perforated: nan
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1360
1340
1320
1300
1280
1260
Nov-2000
Nov-2002
Nov-2004

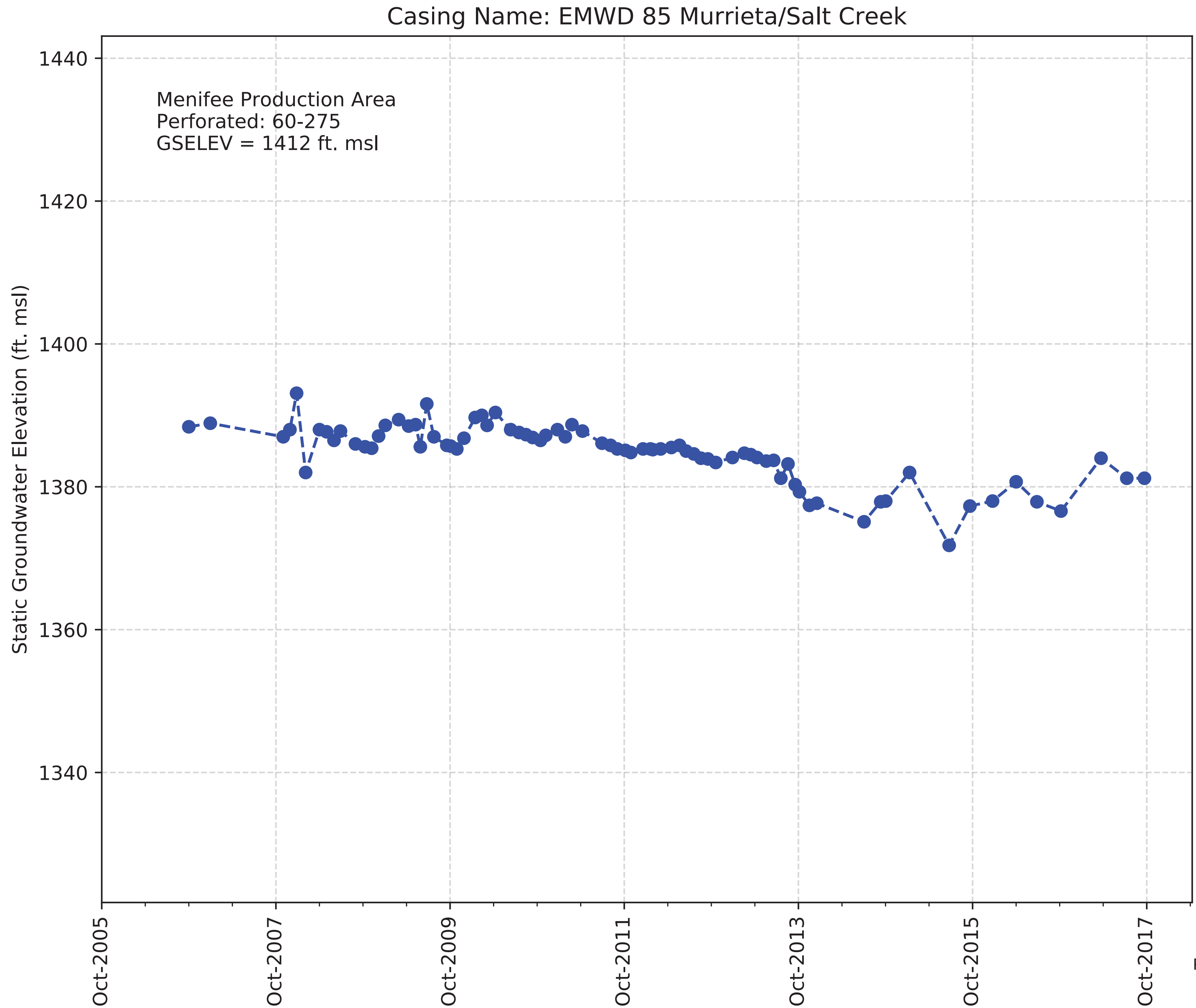

Casing Name: USGS Sun City Golf Course Yellow
Menifee Production Area
Perforated: 365-370
GSELEV = 1413 ft. msl
Static Groundwater Elevation (ft. msl)
1420
1400
1380
1360
1340
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

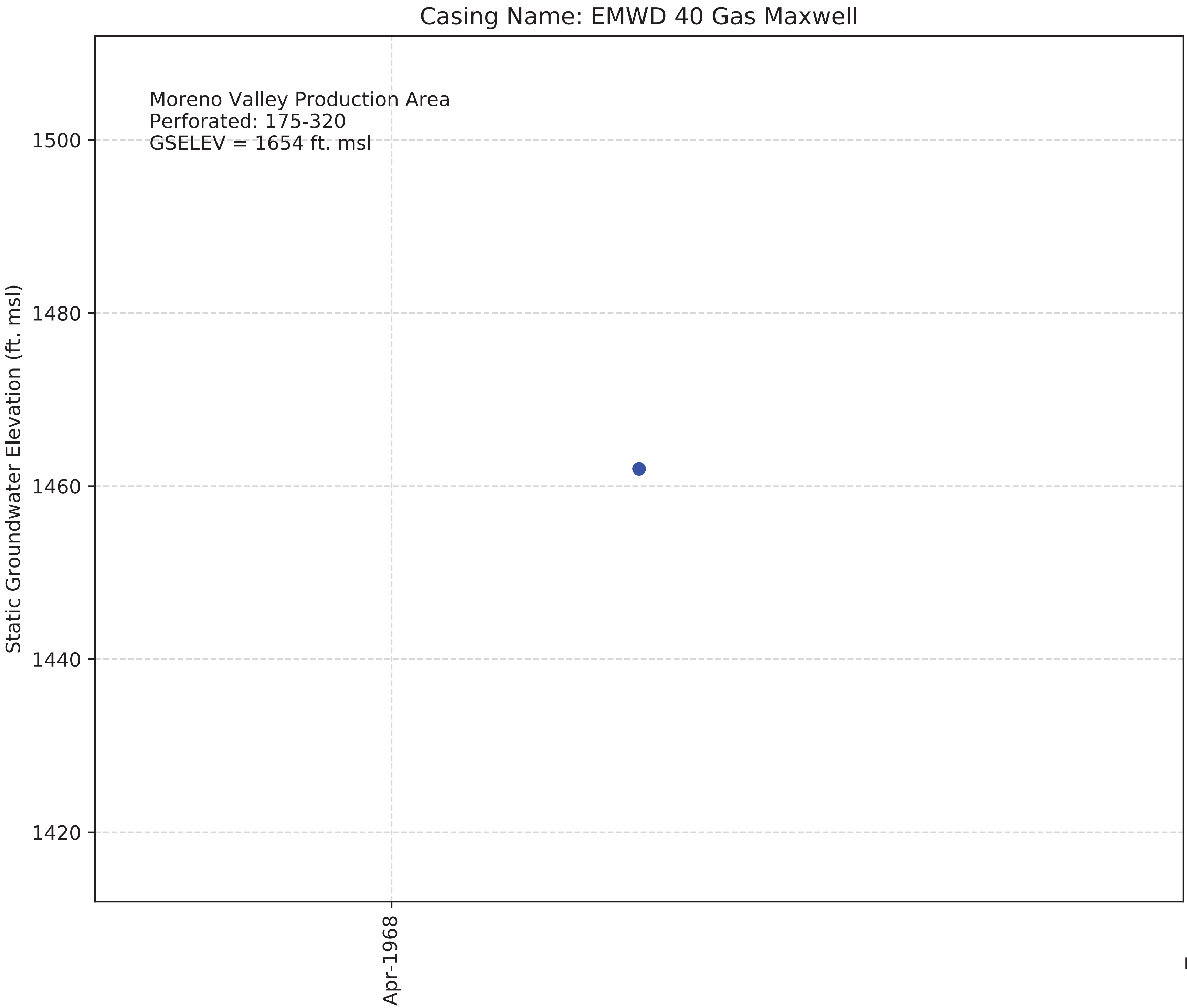

Casing Name: USGS Sun City Golf Course Green
Menifee Production Area
Perforated: 237-242
GSELEV = 1413 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

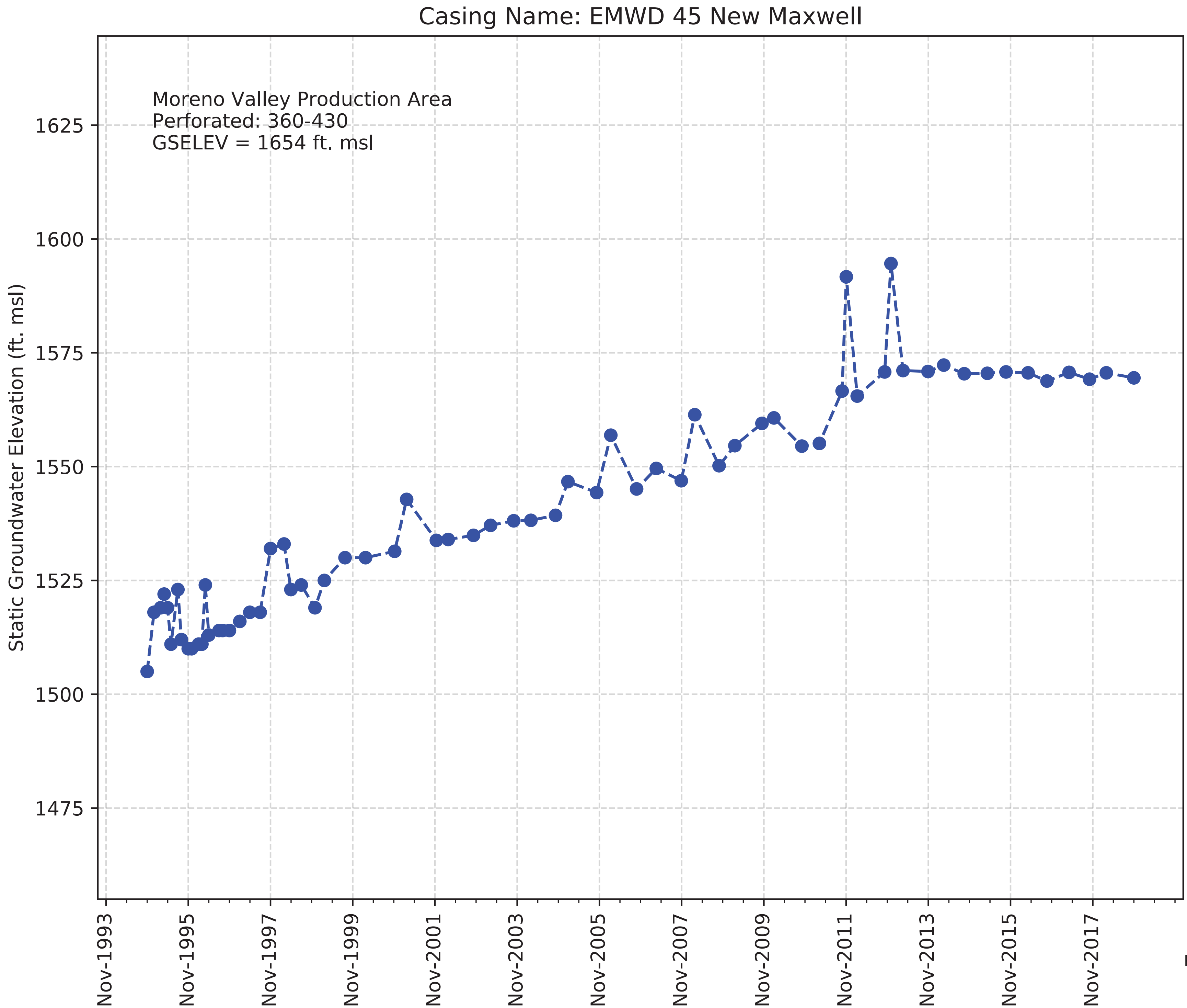

Casing Name: USGS Sun City Golf Course Blue
Menifee Production Area
Perforated: 155-160
GSELEV = 1413 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

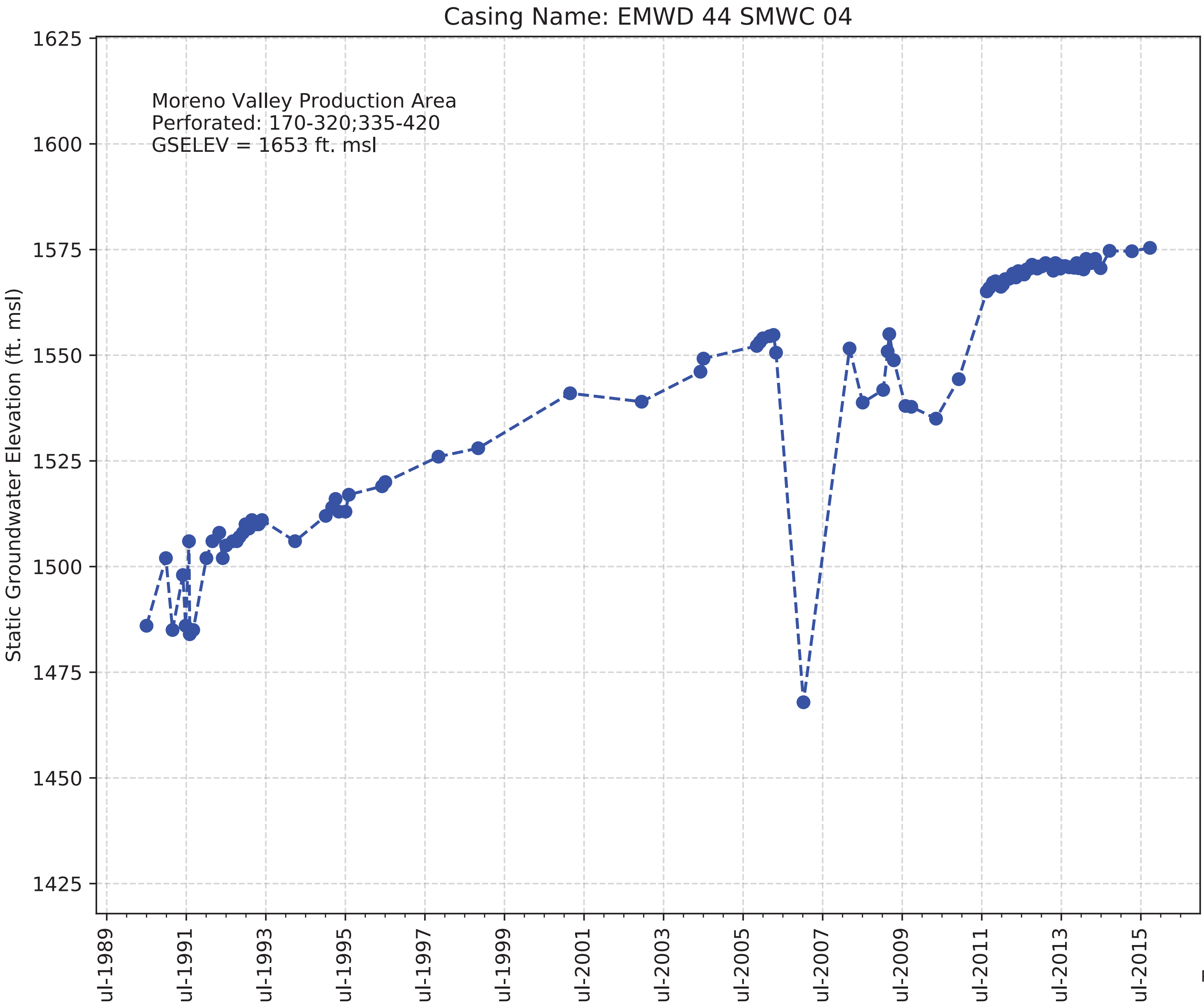

Casing Name: Newport West of Haun OC
Menifee Production Area
Perforated: 40-120
GSELEV = 1428 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1325
1350
1375
1400
1425
1450
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014

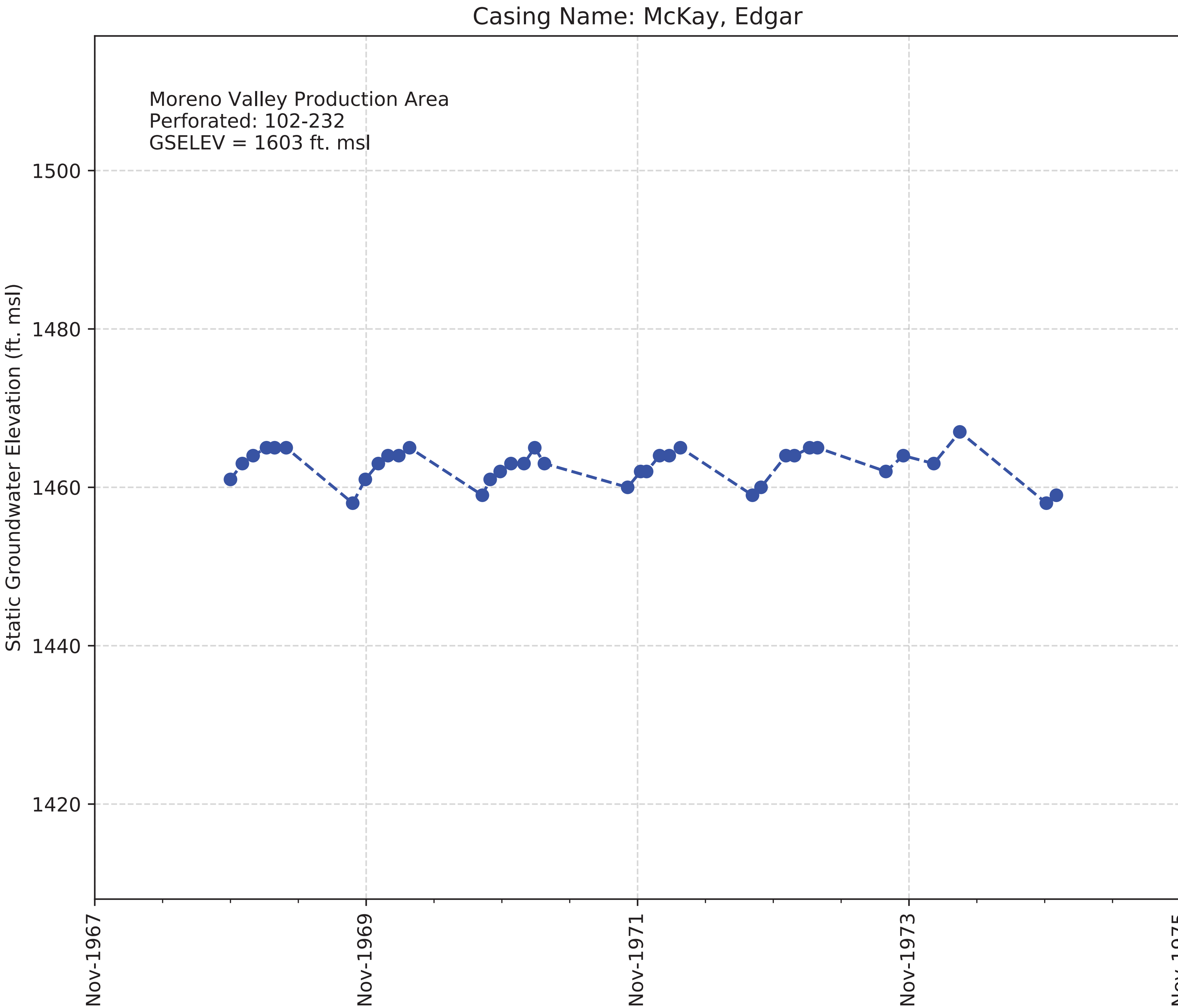

Casing Name: Agri Simpson/Lindenburger East
Menifee Production Area
Perforated: nan
GSELEV = 1455 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
Feb-2002
Feb-2004
Feb-2006

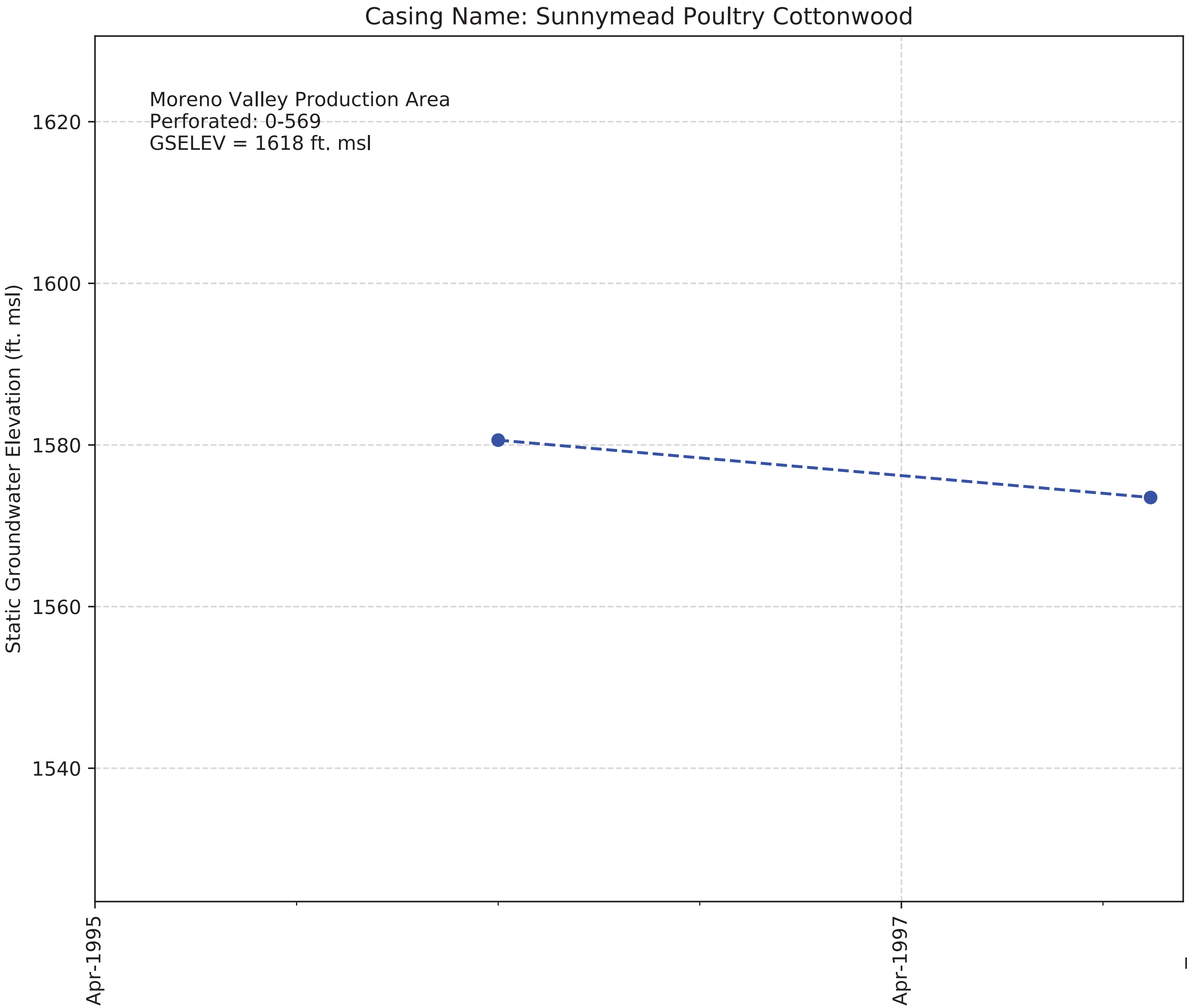

Casing Name: EMWD 85 Murrieta/Salt Creek
Menifee Production Area
Perforated: 60-275
GSELEV = 1412 ft. msl
Static Groundwater Elevation (ft. msl)
1440
1420
1400
1380
1360
1340
Oct-2005
Oct-2007
Oct-2009
Oct-2011
Oct-2013
Oct-2015
Oct-2017

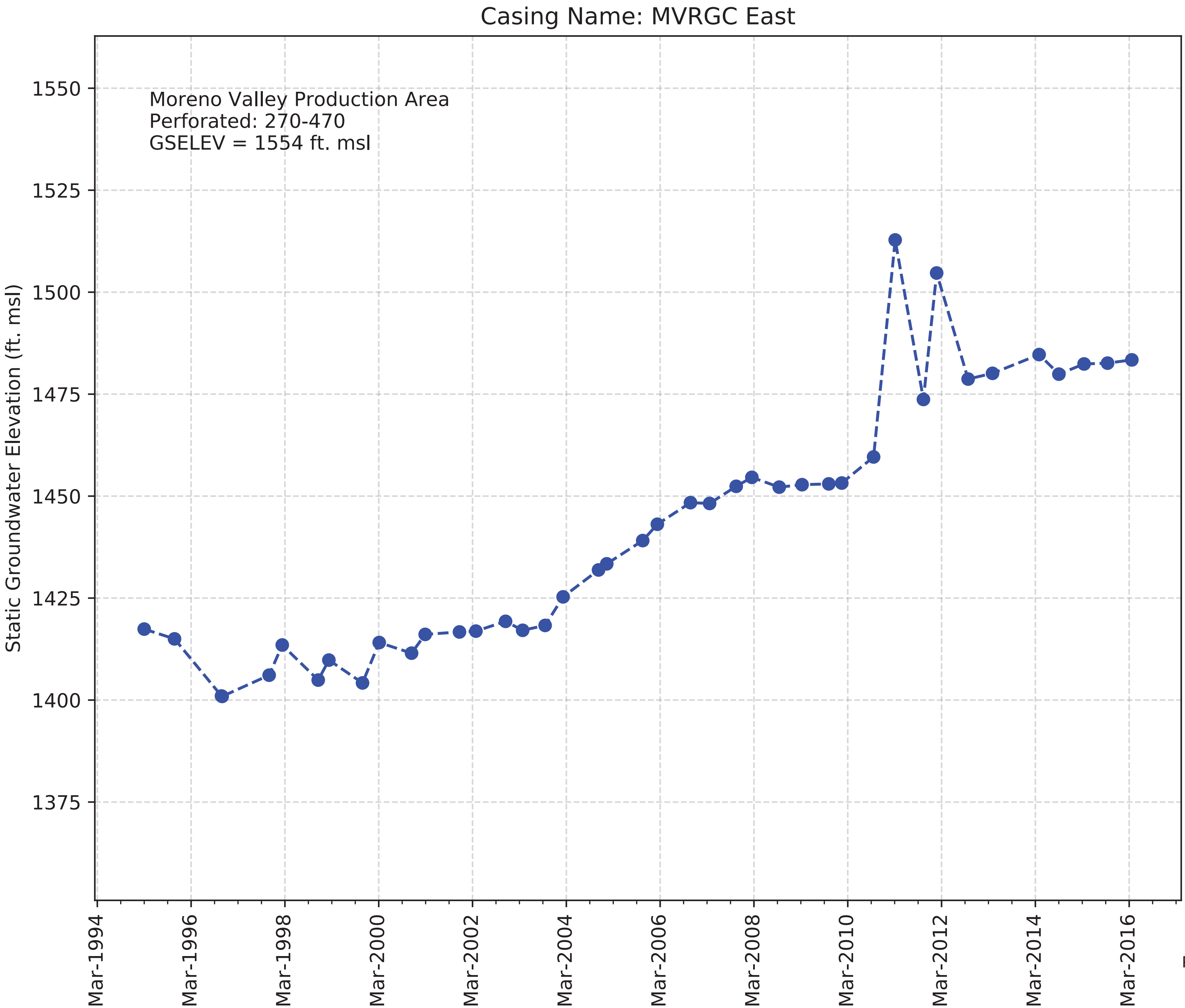

Casing Name: EMWD 40 Gas Maxwell
Moreno Valley Production Area
Perforated: 175-320
GSELEV = 1654 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
Apr-1968

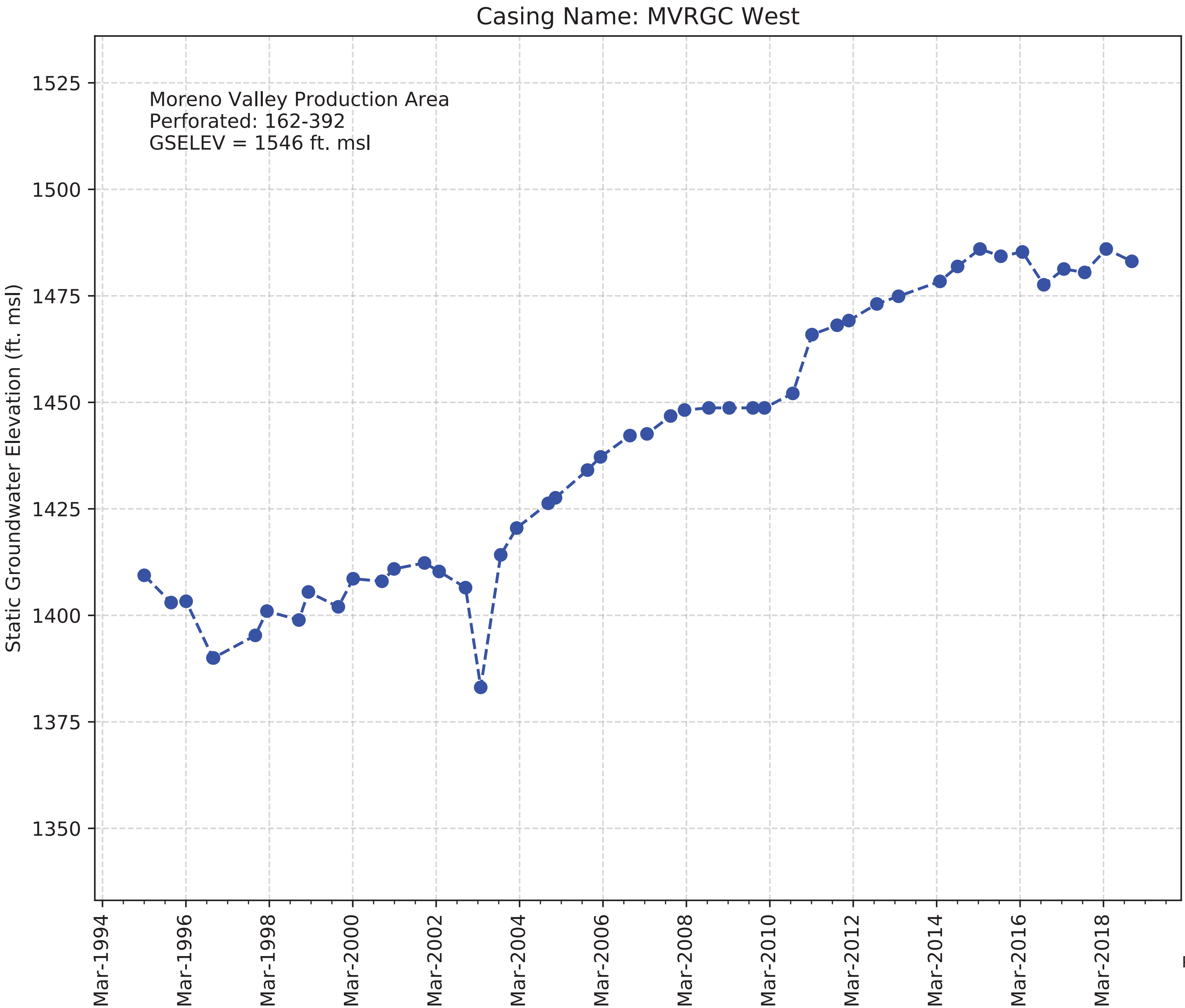

Casing Name: EMWD 45 New Maxwell
Moreno Valley Production Area
Perforated: 360-430
GSELEV = 1654 ft. msl
Static Groundwater Elevation (ft. msl)
1625
1600
1575
1550
1525
1500
1475
Nov-1993
Nov-1995
Nov-1997
Nov-1999
Nov-2001
Nov-2003
Nov-2005
Nov-2007
Nov-2009
Nov-2011
Nov-2013
Nov-2015
Nov-2017

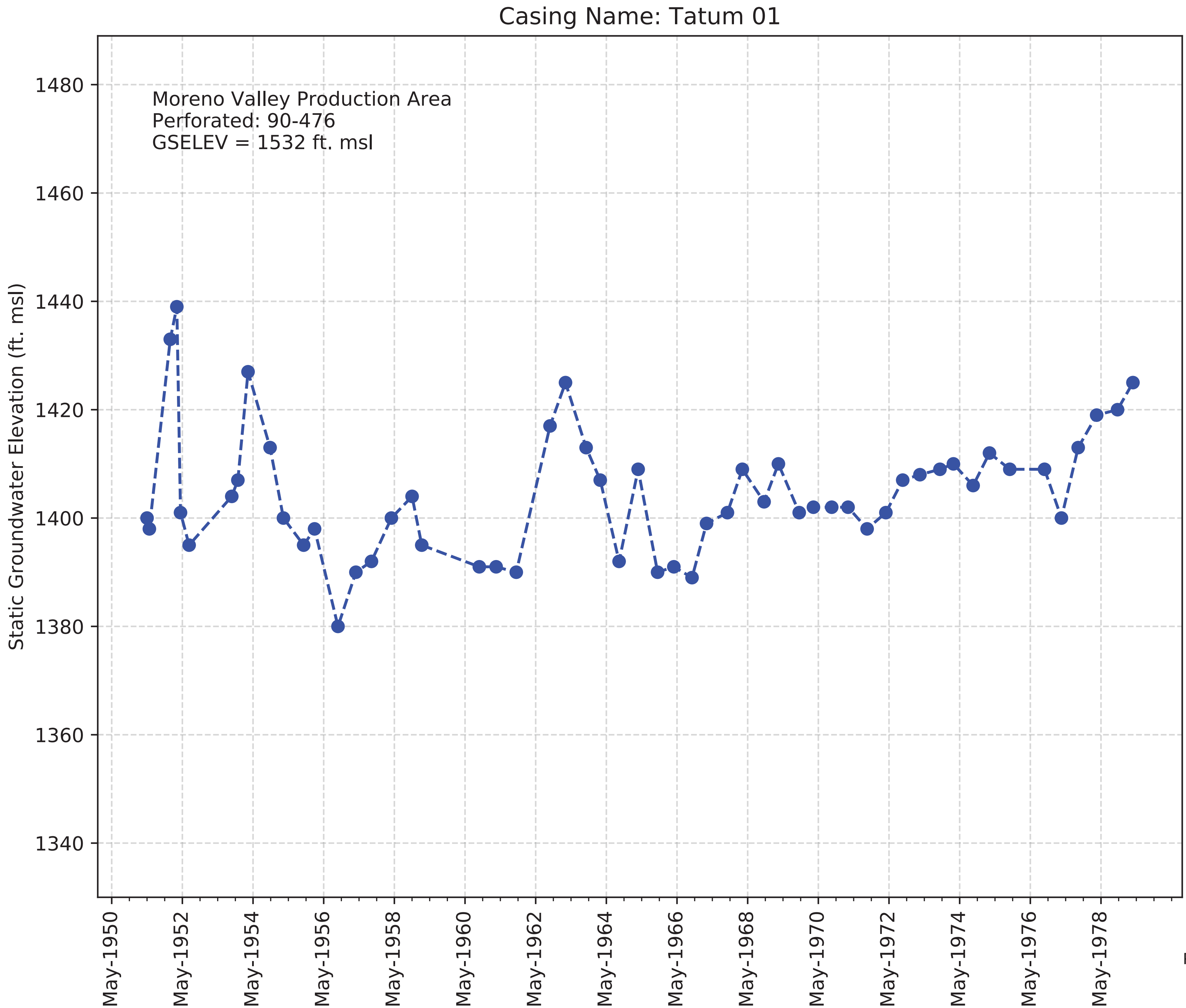

Casing Name: EMWD 44 SMWC 04
Moreno Valley Production Area
Perforated: 170-320;335-420
GSELEV = 1653 ft. msl
Static Groundwater Elevation (ft. msl)
1625
1600
1575
1550
1525
1500
1475
1450
1425
Jul-1989
Jul-1991
Jul-1993
Jul-1995
Jul-1997
Jul-1999
Jul-2001
Jul-2003
Jul-2005
Jul-2007
Jul-2009
Jul-2011
Jul-2013
Jul-2015

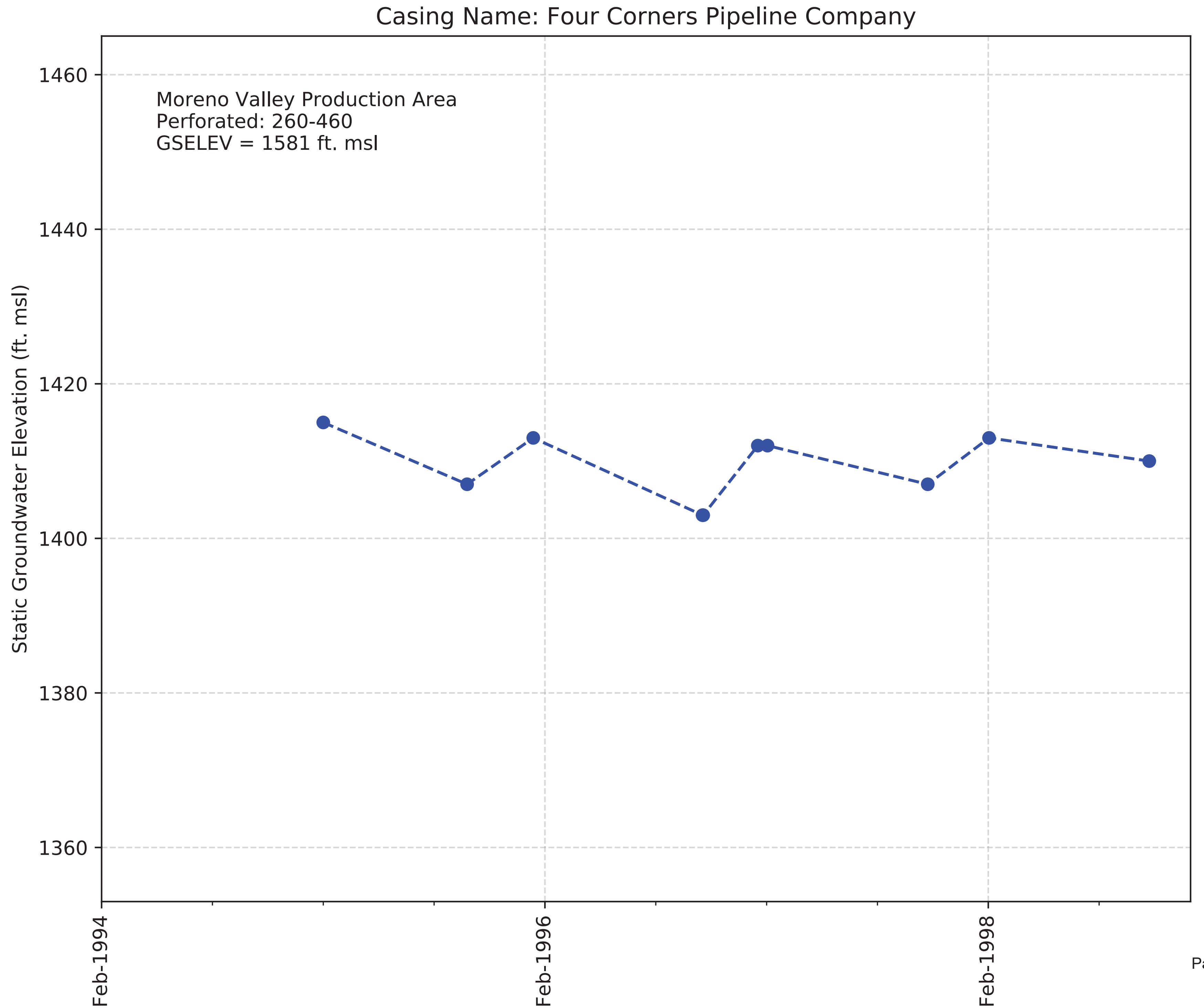

Casing Name: McKay, Edgar
Moreno Valley Production Area
Perforated: 102-232
GSELEV = 1603 ft. msl
Static Groundwater Elevation (ft. msl)
1500
1480
1460
1440
1420
Nov-1967
Nov-1969
Nov-1971
Nov-1973
Nov-1975

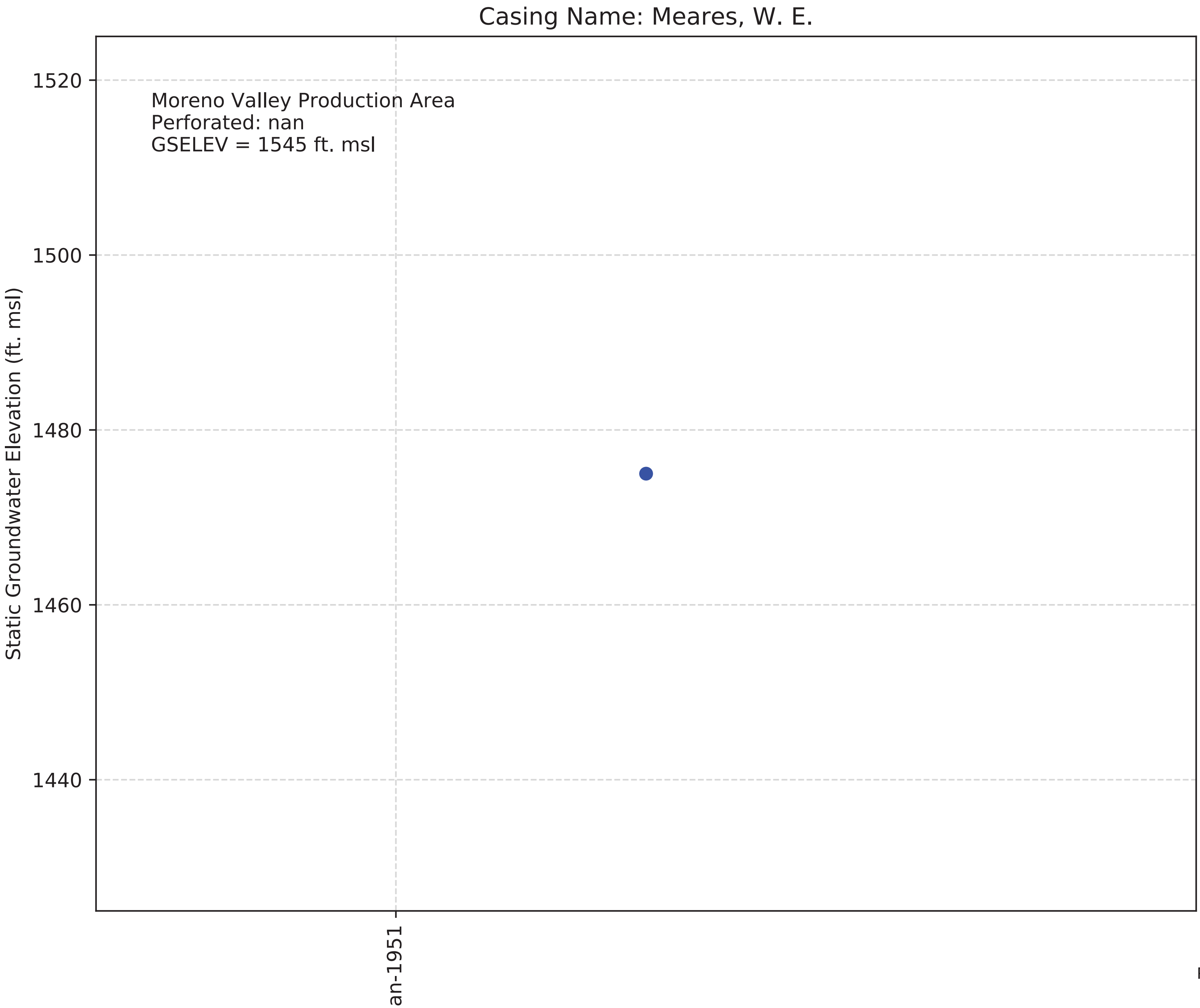

Casing Name: Sunnymead Poultry Cottonwood
Moreno Valley Production Area
Perforated: 0-569
GSELEV = 1618 ft. msl
Static Groundwater Elevation (ft. msl)
1620
1600
1580
1560
1540
Apr-1995
Apr-1997

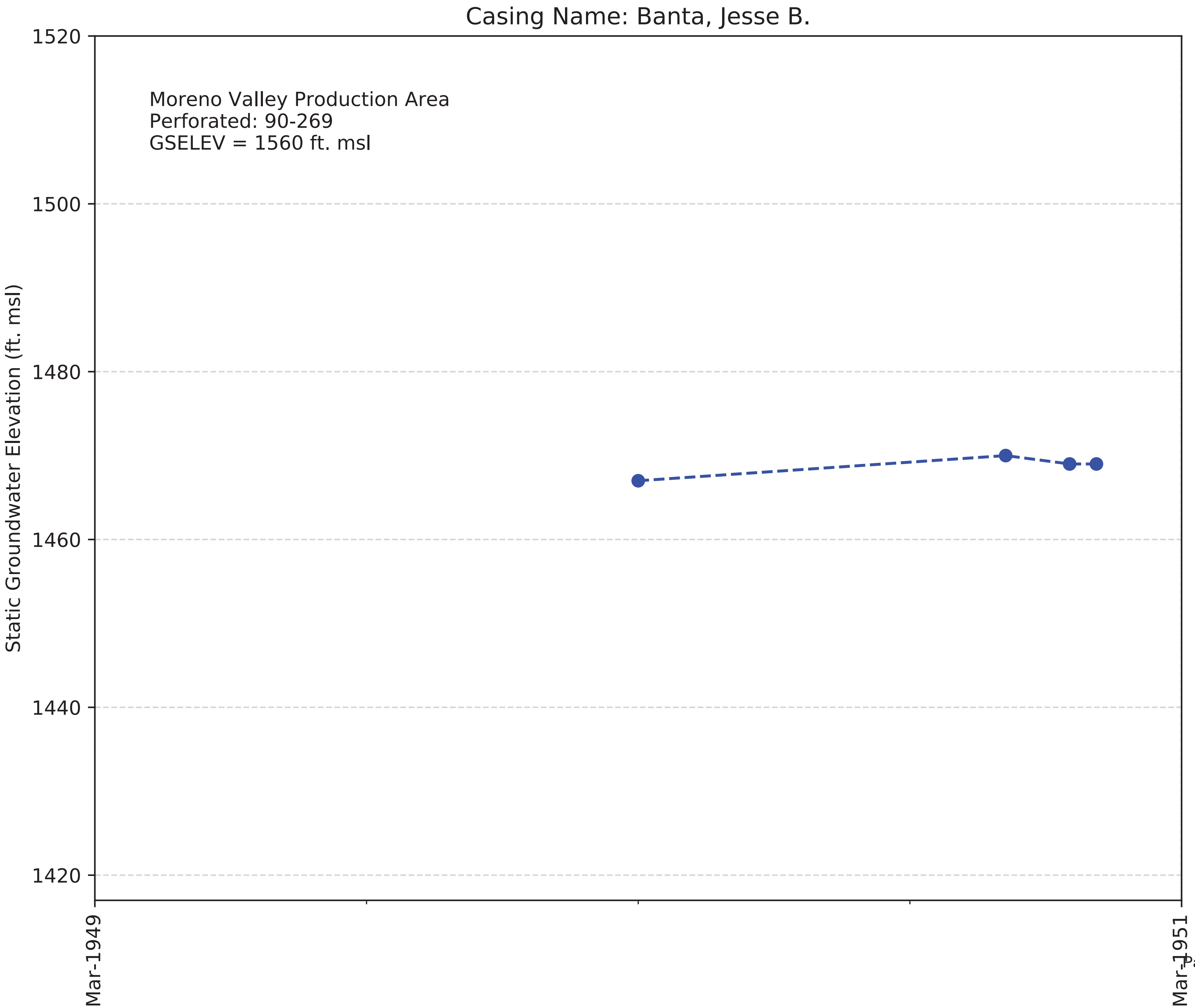

Casing Name: MVRGC East
Moreno Valley Production Area
Perforated: 270-470
GSELEV = 1554 ft. msl
Static Groundwater Elevation (ft. msl)
1550
1525
1500
1475
1450
1425
1400
1375
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016

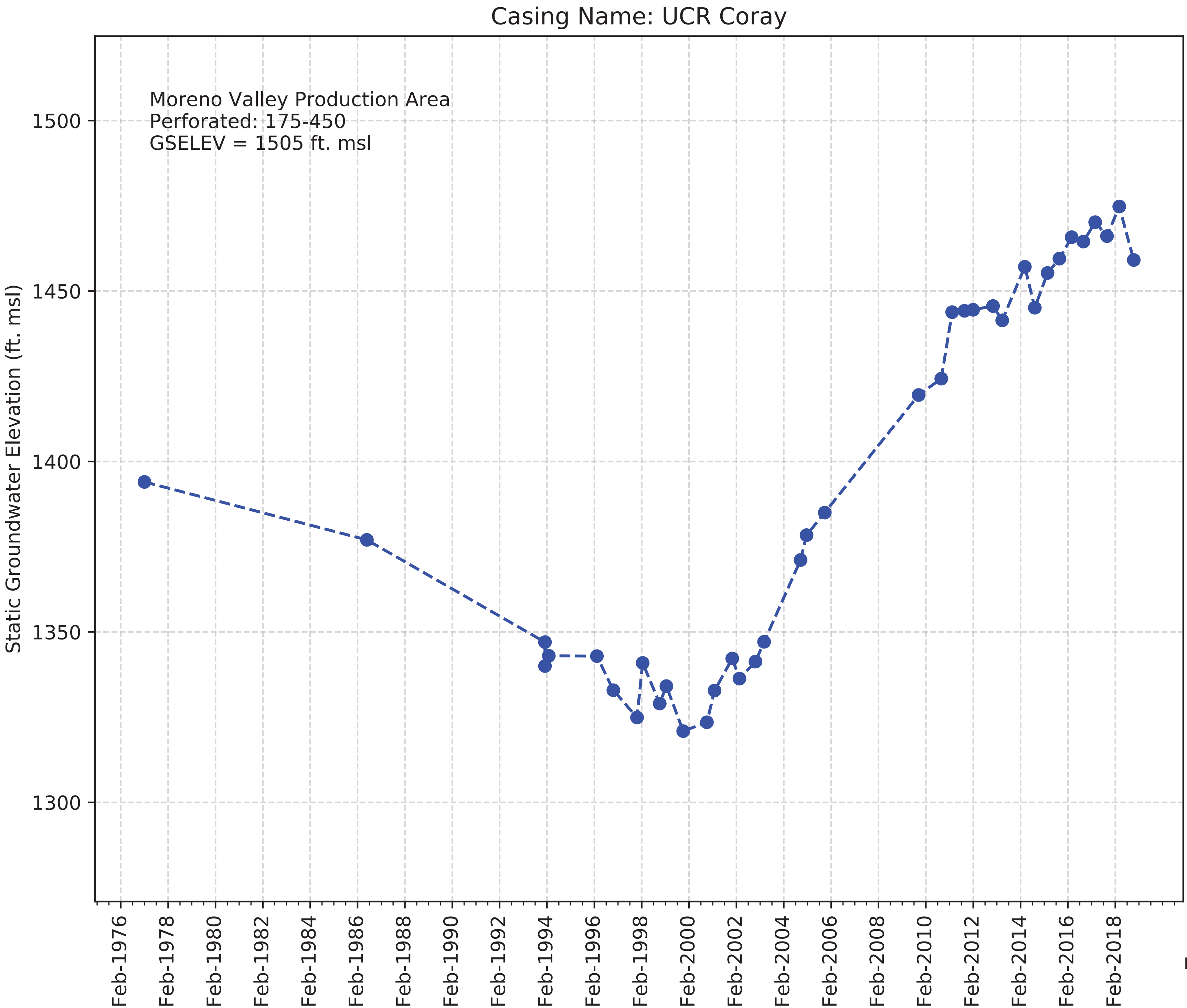

Casing Name: MVRGC West
Moreno Valley Production Area
Perforated: 162-392
GSELEV = 1546 ft. msl
Static Groundwater Elevation (ft. msl)
1525
1500
1475
1450
1425
1400
1375
1350
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010
Mar-2012
Mar-2014
Mar-2016
Mar-2018

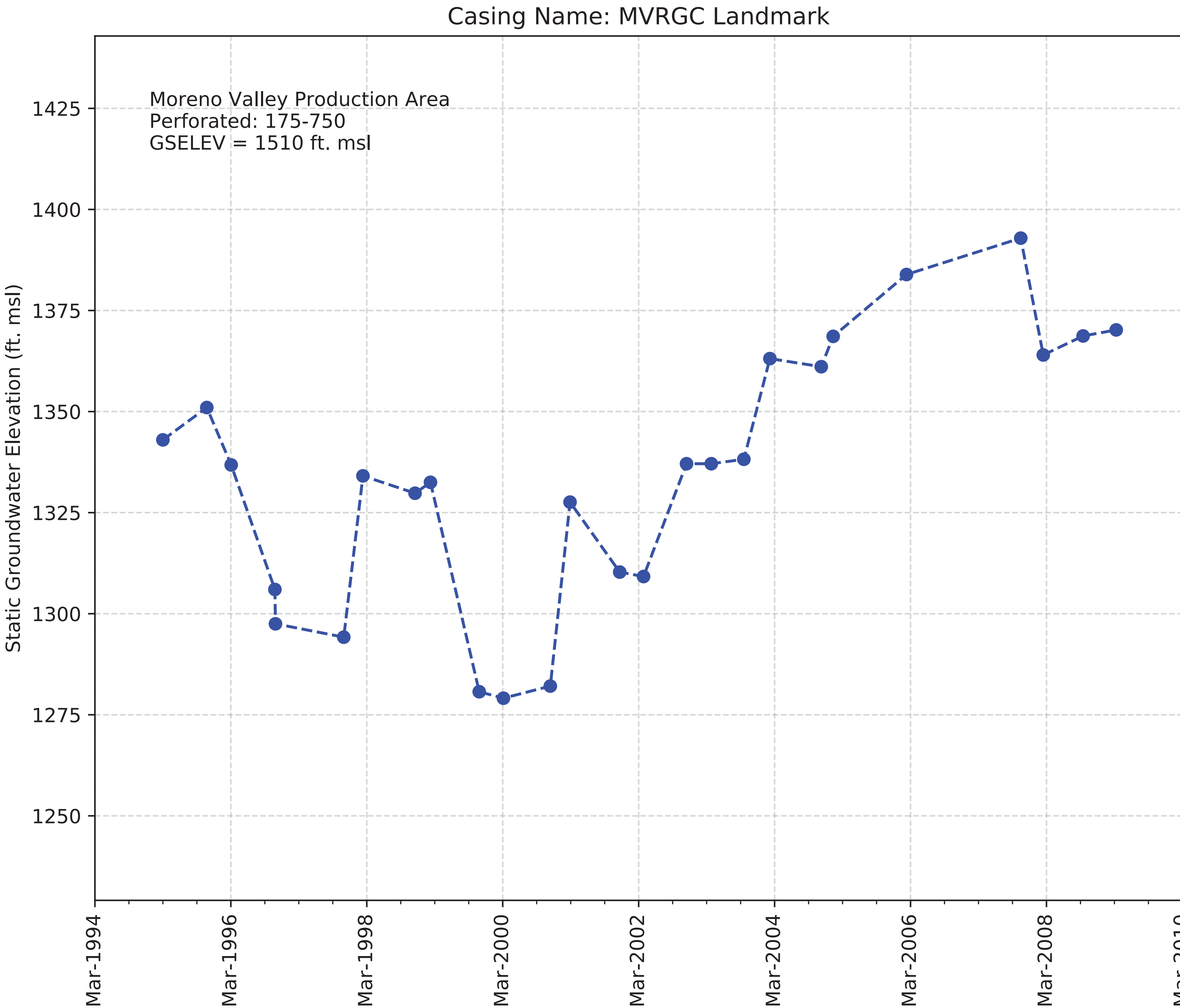

Casing Name: Tatum 01
Moreno Valley Production Area
Perforated: 90-476
GSELEV = 1532 ft. msl
Static Groundwater Elevation (ft. msl)
1480
1460
1440
1420
1400
1380
1360
1340
May-1950
May-1952
May-1954
May-1956
May-1958
May-1960
May-1962
May-1964
May-1966
May-1968
May-1970
May-1972
May-1974
May-1976
May-1978


Casing Name: Four Corners Pipeline Company
Moreno Valley Production Area
Perforated: 260-460
GSELEV = 1581 ft. msl
Static Groundwater Elevation (ft. msl)
1460
1440
1420
1400
1380
1360
Feb-1994
Feb-1996
Feb-1998


Casing Name: Meares, W. E.
Moreno Valley Production Area
Perforated: nan
GSELEV = 1545 ft. msl
Static Groundwater Elevation (ft. msl)
1520
1500
1480
1460
1440
Jan-1951


Casing Name: Banta, Jesse B.
Moreno Valley Production Area
Perforated: 90-269
GSELEV = 1560 ft. msl
Static Groundwater Elevation (ft. msl)
1520
1500
1480
1460
1440
1420
Mar-1949
Mar-1951


Casing Name: UCR Coray
Moreno Valley Production Area
Perforated: 175-450
GSELEV = 1505 ft. msl
Static Groundwater Elevation (ft. msl)
1300
1350
1400
1450
1500
Feb-1976
Feb-1978
Feb-1980
Feb-1982
Feb-1984
Feb-1986
Feb-1988
Feb-1990
Feb-1992
Feb-1994
Feb-1996
Feb-1998
Feb-2000
Feb-2002
Feb-2004
Feb-2006
Feb-2008
Feb-2010
Feb-2012
Feb-2014
Feb-2016
Feb-2018


Casing Name: MVRGC Landmark
Moreno Valley Production Area
Perforated: 175-750
GSELEV = 1510 ft. msl
Static Groundwater Elevation (ft. msl)
1425
1400
1375
1350
1325
1300
1275
1250
Mar-1994
Mar-1996
Mar-1998
Mar-2000
Mar-2002
Mar-2004
Mar-2006
Mar-2008
Mar-2010